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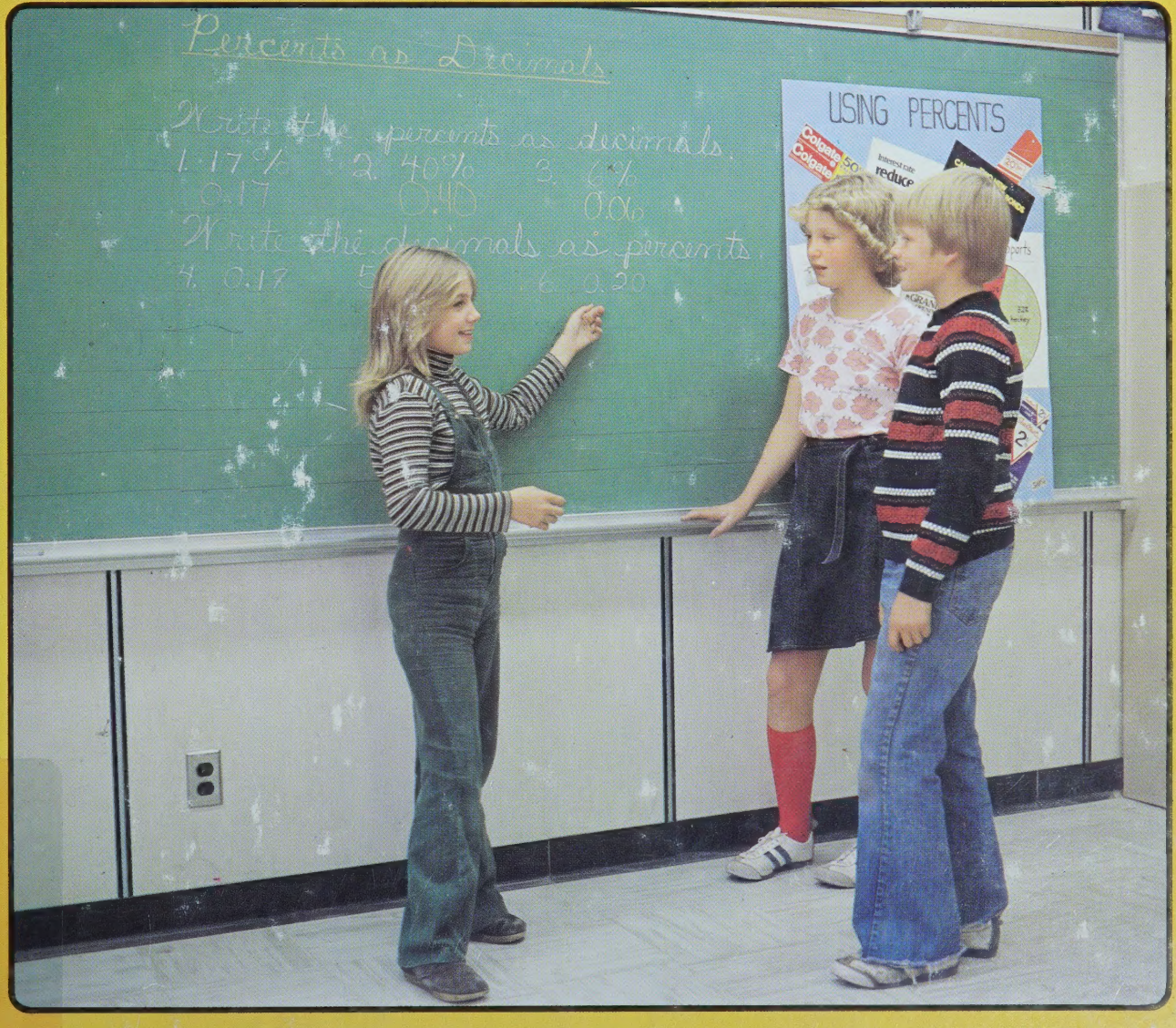

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OUR LADY OF FATIMA SCHOOL
9825 - 156th STREET
EDMONTON, ALBERTA

starting points in mathematics

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Level 6

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To the Students

Most of the lessons in this book are teaching lessons. Others are for practice.

The first part of a teaching lesson shows you what is to be learned.

Working Together

The second part of a teaching lesson allows you to check your understanding step by step.

For this part, you may work together with your teacher, with each other, or you may work by yourself to check your understanding.

Exercises

The third part of a teaching lesson gives you practice and lets you apply what you have learned.

7 MULTIPLYING AND DIVIDING DECIMALS

Multiplying Decimals and Whole Numbers

The camera store has 27 rolls of one type of film. The price of each roll is $3.15. What is the value of the 27 rolls?

Multiply 27 and 3.15.

$3.15 has the same value as 315 cents. Think of 3.15 as 315 hundredths.

For the product,

$$\begin{array}{r} 3.15 \\ \times\ 27 \\ \hline \end{array}$$

(315 hundredths $\times$ 27)

you need to know how to multiply 7 and 315,

$$\begin{array}{r} 3.15 \\ \times\ 27 \\ \hline 2205 \end{array}$$

(315 hundredths $\times$ 27 = 2205)

and how to multiply 2 and 315.

$$\begin{array}{r} 3.15 \\ \times\ 27 \\ \hline 2205 \\ 6300 \end{array}$$

(315 hundredths $\times$ 27; 2205; 6300)

Then add and place the decimal point.

$$\begin{array}{r} 3.15 \\ \times\ 27 \\ \hline 2205 \\ 6300 \\ \hline 85.05 \end{array}$$

(315 hundredths $\times$ 27; 2205; 6300; 8505 hundredths)

The value of the 27 rolls of film is $85.05.

Working Together

Complete each multiplication.

1.	481 × 7 = ▒▒	481 tenths × 7 = ▒▒ tenths	48.1 × 7 = ▒▒
2.	145 × 22 = ▒▒	145 hundredths × 22 = ▒▒ hundredths	1.45 × 22 = ▒▒
3.	2875 × 35 =	2875 thousandths × 35 =	2.875 × 35 =
4.	13 × 6 =	13 thousandths × 6 =	0.013 × 6 =

Multiply.

5. 3.15 × 8 **6.** 14.3 × 79 **7.** 4.756 × 12 **8.** 0.67 × 15 **9.** 0.004 × 23 **10.** 20.3 × 375

Exercises

Multiply.

1. 57.7 × 28 **2.** 5.77 × 28 **3.** 2.695 × 9 **4.** 0.48 × 75 **5.** 375.6 × 237 **6.** \$123.45 × 67

7. 13 × 1.07 **8.** 6 × 58.6 **9.** 39 × 0.003 **10.** 10 × 20.72
11. 40 × 3.7 **12.** 76 × 0.085 **13.** 41 × 74.8 **14.** 5 × \$97.34

Solve.

15. The sports store has 7 tennis rackets in stock at \$43.75 each. What is the value of the tennis rackets?

16. The supermarket had a delivery of 144 packages of butter which were to be priced at \$1.39 each. What was the value of the butter?

When a number is multiplied by 10, each digit moves one place to the left.

Example:

	tens	ones	tenths	hundredths		tens	ones	tenths	hundredths
10 ×	3	6	7		=	3	6	7	

Multiply each number by 10. Write only the products. Do these in your head.

17. 1.14 **18.** 28.62 **19.** 3.588 **20.** 670 **21.** 0.016 **22.** 7.5

Special Features

Practice with addition, subtraction, multiplication, and division

KEEPING SHARP

Some interesting ideas for fun and enrichment

try this

Lessons and activities to help you learn the skills you need for solving problems

PROBLEM SOLVING

Special * exercises give you more practice with problem solving.

Checking Up

End-of-unit lessons let you check how you have done with the work in the unit.

Checking Skills

Four special reviews let you check your skills with addition, subtraction, multiplication, and division.

1 NUMERATION

Thinking About Numbers

How many meals
have you eaten?

How long
have you slept?

How many words
do you know?

How long have you
spent reading?

How much money
have you spent?

How many trees
are in Canada?

How many kinds of trees
are in Canada?

How many needles
are on a spruce tree?

How thick is
a maple leaf?

How tall is
the tallest tree?

How many times have you looked at the stars?

How many stars are in the sky?

How far can you see on a clear night?

How far away is the sun?

How heavy is the earth?

How many people have you seen at one time?

How many people have you met?

How many people do you know?

How many places have you visited?

How many cities would you like to visit?

Numbers to 999 999

In one year recently, 140 394 passenger cars were registered in Newfoundland.

hundreds	tens	ones	hundreds	tens	ones
thousands					
1	4	0	3	9	4

In a numeral with four, five, or six digits, the digits in these three places show **thousands**.

140 thousand 394
passenger cars
were registered
in Newfoundland.

If you know three-digit numerals and the word "thousands", you can read any numeral with up to six digits.

The **standard form** for
140 thousand 394
is 140 394 .

In **expanded form**,
140 394 = 100 000 + 40 000 + 300 + 90 + 4

Working Together

Use the place-value chart above to help you answer these questions.

Example: The 1 in 316 257 means 1 ten thousand.

1. What does the 7 mean in 47 632?

2. What does the 2 mean in 250 388?

3. What does the 5 mean in 452 984?

Complete. Leave a space after the thousands.

4.	366 thousand 164	366 164
5.	48 thousand	?
6.	? thousand ?	19 008
7.	? ? ?	502 073

Write each in expanded form.

8. 12 345

9. 306 000

10. 70 302

Write each in standard form.

11. eight hundred two thousand

12. 700 000 + 50 000

13. 7 ten thousands 5 thousands

Exercises

Complete.

1.	736 thousand 418	?
2.	? thousand ?	429 255
3.	92 thousand 29	?
4.	? ? ?	102 700
5.	? ? ?	75 008

What does each 4 mean?

6. 47 632
7. 366 164
8. 452 984
9. 140 394

Write each in expanded form.

10. 6067
11. 250 388
12. 308 020
13. 50 403

Write each in a standard form.

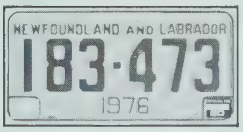
14. 80 thousand
15. forty thousand forty
16. 20 000 + 3 000 + 60
17. 5 hundred thousands 6 ten thousands

Write each sentence using a numeral in standard form.

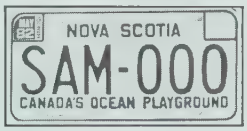
18. In the territories, twelve thousand seven hundred twenty-seven cars were registered.
19. In Atlantic Canada, seven hundred fifty-four thousand six hundred seventy-one cars were registered.

How many thousands of passenger cars were registered in

***20.** Alberta?
***21.** British Columbia?
***22.** Ontario?
***23.** Quebec?



140 394



316 257

47 632

250 388

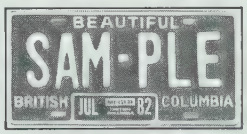
452 984

366 164

6 660

6 067

1 040 277



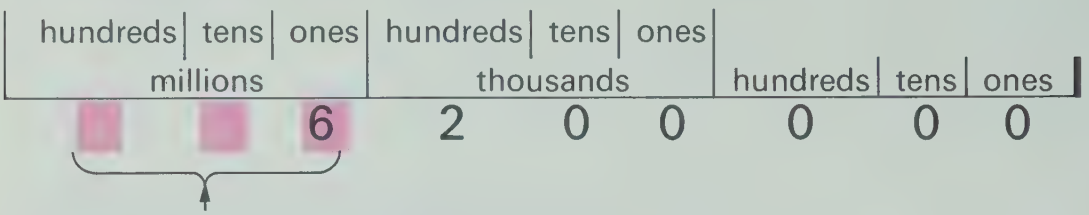
1 098 821

3 390 837

2 568 665

Numbers to 999 999 999 (and Beyond)

In August, there are about 6 200 000 wild geese in Canada before they fly south.



In a numeral with seven, eight, or nine digits, the digits in these three places show **millions**.

In August, there are about 6 million 200 thousand wild geese in Canada.

The **standard form** for 6 million 200 thousand is 6 200 000.

If you know three-digit numerals and the words "thousands" and "millions", you can read any numeral with up to nine digits.

In **expanded form**, 6 200 000 = 6 000 000 + 200 000

Working Together

Use the place-value chart shown above to help you answer these questions.

Example: The 1 in 4 150 000 means 1 hundred thousand.

1. What does the 4 mean in 2 140 000?

2. What does the 8 mean in 870 300 000?

3. What does the 365 mean in 365 480 000?

Leave a space after the millions and after the thousands.

Complete.

4.	758 million 300 thousand	758 300 000
5.	97 million	?
6.	? million ? thousand	9 002 000
7.	? ? ? ?	646 030 000

Write each in expanded form.

8. 831 530 000

9. 7 050 000

10. 54 706 000

Write each in standard form.

11. four hundred three million

12. 2 000 000 + 900 000

13. 5 hundred millions 7 ten millions

Exercises

Complete.

1.	402 million 760 thousand	?
2.	? million ? thousand	538 410 000
3.	27 million	?
4.	? million ? thousand	1 070 000
5.	? ? ? ?	340 006 000
6.	? ?	80 000 000

What does each 6 mean?

7. 165 340 000

8. 20 607 000

Write each in expanded form.

9. 619 085 000

10. 93 408 000

11. 5 102 000

Write each in standard form.

12. fifty million

13. seven million ten thousand

14. 40 000 000 + 6 000

15. 200 000 000 + 3 000 000

16. 1 ten million 5 hundred thousands

17. 9 hundred millions 2 millions

In a numeral with 12 digits, the digits in the first three places show **billions**.

124 billion 480 million.

hundreds	tens	ones	hundreds	tens	ones	hundreds	tens	ones	hundreds	tens	ones
billions			millions			thousands					
1	2	4	4	8	0	0	0	0	0	0	0

What does each 9 mean?

18. 49 217 000 000

19. 96 000 000 000

Write in expanded form.

20. 503 005 000 000

Write each in standard form.

21. 59 billion 74 million

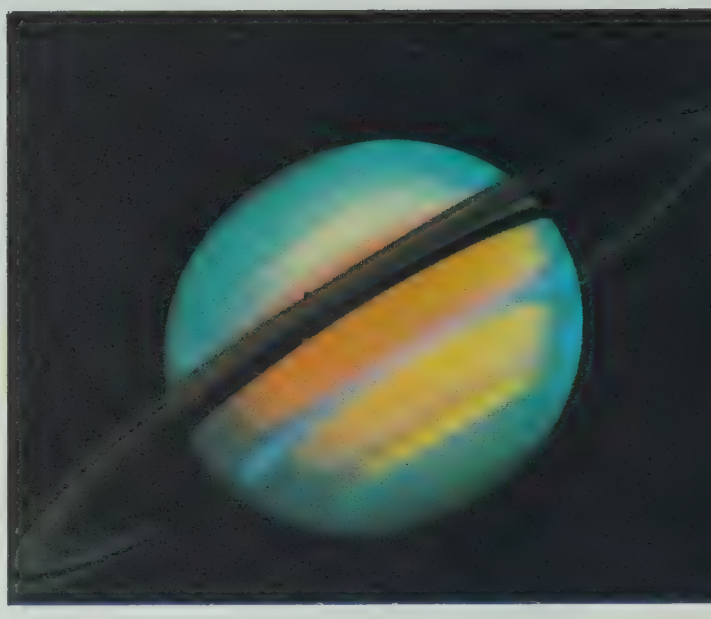
22. 8 billion 9 million 60 thousand

23. 8 000 000 000 + 4 000 000

24. 6 ten billions 8 hundred millions

Comparing and Ordering Numbers

Titan, the largest moon of Saturn, is 1 161 000 km (kilometres) from the planet. Hyperion, one of the smallest moons, is 1 442 000 km from the planet. Which moon is farther from Saturn?



1 161 000
1 442 000
} show 1 million.

1 161 000 shows 161 millions.
1 442 000 shows 442 millions.

442 is greater than 161, so
1 442 000 is greater than 1 161 000.

$$1\,442\,000 > 1\,161\,000$$

Hyperion is farther from Saturn than Titan.

Working Together

Both numerals show the same number of millions.
Which shows the greater number of thousands?

1.

693 428 000
693 528 000

2.

7 964 000
7 946 000

3.

53 713 000
53 317 000

Which is greater,

4. 2 833 290 or 2 843 290?

5. 81 346 000 or 81 344 000?

List from least to greatest.

6.

801 577 000
811 597 000
801 597 000
801 957 000

List from greatest to least.

7.

382 300 000
38 800 000
328 300 000
382 800 000

Use $>$, $<$, or $=$ to make true statements.

8. 363 920 000 ◯ 373 920 000

9. 98 433 000 ◯ 98 343 000

Exercises

Which is greater,

1. 29 374 or 280 374?
2. 92 400 or 93 000?
3. 31 526 000 or 31 536 000?
4. 8 080 000 or 8 008 000?
5. 1 298 000 or 1 289 000?

List from least to greatest.

11.

5 055 000	50 555 000
50 550 000	505 501 000
550 051 000	5 050 000

List from greatest to least.

12.

628 368 000	6 826 000
628 382 000	626 862 000
62 886 000	628 386 000

List the planets and their distances from the Sun in order—from the one closest to the Sun to the one farthest from the Sun.

13.

Planet	Average distance from the Sun in kilometres
Earth	149 500 000
Jupiter	778 000 000
Mars	227 800 000
Mercury	57 900 000
Neptune	4 497 000 000
Pluto	5 900 000 000
Saturn	1 427 000 000
Uranus	2 869 000 000
Venus	108 100 000

*14. How far is Halley's Comet from the Sun?

Use $>$, $<$, or $=$ to make true statements.

6. 6 996 ___ 6 969
7. 780 087 000 ___ 780 087 000
8. 40 004 000 ___ 40 040 000
9. 7 720 000 ___ 7 702 000
10. 90 900 000 ___ 99 900 000

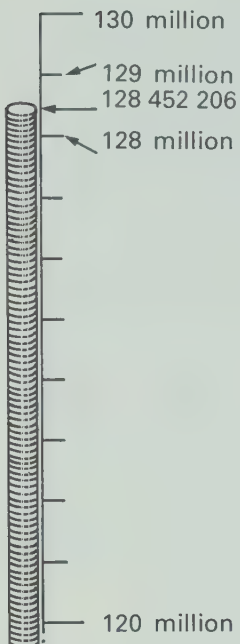
Four two-digit numerals can be made with the digits 5 and 9.

59, 95, 55, 99

1. List the two-digit numerals that can be made with the digits 4 and 6.
2. List the two-digit numerals that can be made with the digits 4 and 6 without using a digit twice in a numeral.
3. List the two-digit numerals that can be made with the digits 4, 6, and 7.
4. List the two-digit numerals that can be made with the digits 4, 6, and 7 without using a digit more than once in a numeral.
5. List the three-digit numerals that can be made with the digits 4, 6, and 7 without using a digit more than once in a numeral.
6. List the three-digit numerals that can be made with the digits 4, 6, and 7.

try this

Rounding



In 1977, Canada minted
128 452 206 dimes.

Round 128 452 206 to the nearest million.

128 452 206 is closer to
128 million than to 129 million.
128 452 206 rounded to the
nearest million is 128 000 000.

In 1977, Canada minted
about 128 000 000 dimes.

Working Together

When rounding to this place,
first check the digit in (this place).

hundreds	tens	ones	hundreds	tens	ones	hundreds	tens	ones
millions			thousands					

1. When rounding to the nearest hundred million,
first check the digit in the ? place.

If the digit you check is
5, 6, 7, 8, or 9, round up.

If the digit you check is
0, 1, 2, 3, or 4, round down.

Would you round down or up
to the nearest ten million?

2. 453 621 000

3. 415 903 000

Round to the

4. nearest million.
13 610 000

5. nearest ten million.
46 000 000

6. nearest hundred million.
654 530 000

Exercises

Complete.

	Round to the nearest	million	ten million
1.	63 106 000		
2.	756 480 000		
3.	99 977 000		
4.	204 852 000		

For the coins minted in 1977, round

to the nearest million, the number of

5. nickels. **6.** one-dollar coins.

to the nearest hundred thousand, the number of

7. dimes. **8.** fifty-cent coins.

to the nearest hundred million, the number of

9. pennies. **10.** dimes.

to the nearest ten million, the number of

11. nickels. **12.** quarters.

13. pennies. **14.** dimes.

In 1977, 1 066 735 698 coins were being used in Canada. Round this number to the nearest

15. million. **16.** ten million.

17. hundred million. **18.** billion.

This shows how many coins were minted in 1977.

Canadian coins are minted in six different values.

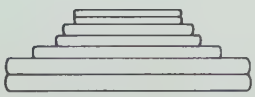
1. Show the value of each coin in three ways.

Give the value of each stack of coins.

2.

3.

4.



5. How tall would the stack on p. 10 be?

PROBLEM SOLVING

Decimals

One leaf of this book
is 0.075 mm (millimetre) thick.

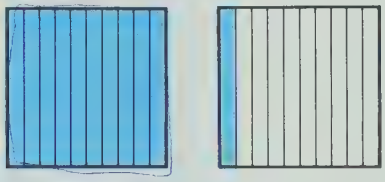
0.075 is a **decimal**.
The . is a **decimal point**.

0.075 is read seventy-five thousandths.
0.075 means 75 of 1000 equal parts.

Working Together

How many wholes are there?
How many tenths are there?
Write the decimals.

1.

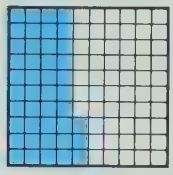


2.

ones	tenths
3	6

How many wholes are there?
How many hundredths are there?
Write the decimals.

3.

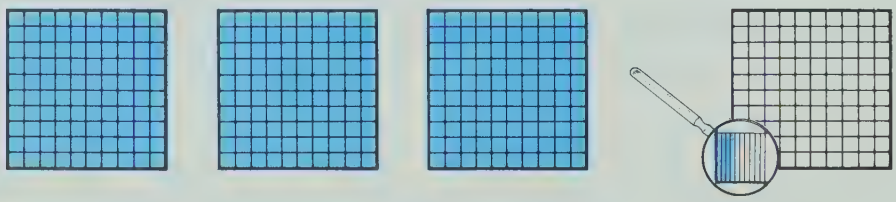


4.

tens	ones	tenths	hundredths
9	0	0	7

How many wholes and thousandths are there?
Write the decimals.

5.



6.

ones	tenths	hundredths	thousandths
0	1	7	9

Write the decimals.

7. forty and five-hundredths

8. three hundred six-thousandths

Write the words.

9. 0.8 **10.** 2.308 **11.** 1.46 **12.** 0.005

When you read or write a decimal in words, use "and" for the decimal point.

Exercises

Write the decimals.

1.

hundreds	tens	ones	tenths
2	3	0	3

2.

tens	ones	tenths	hundredths
1	8	9	4

3.

ones	tenths	hundredths	thousandths
0	2	0	7

4. seven-tenths
5. eleven and three-thousandths
6. nineteen-hundredths
7. eight hundred one-thousandths
8. sixty and two-hundredths
9. five hundred sixty-six thousandths
10. five hundred and sixty-six thousandths

What does each 5 mean?

11. 1.58
12. 6.35
13. 1.005
14. 25.2

Copy and complete.

15. 10.16, 10.17, 10.18, ▒, ▒, ▒
16. 0.302, 0.301, 0.300, ▒, ▒, ▒
17. 0.96, 0.97, 0.98, ▒, ▒, ▒

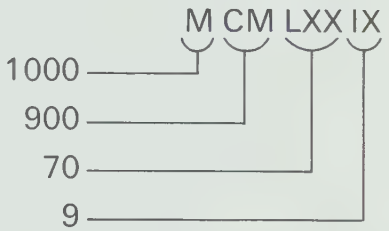
Write each numeral in words.

	Coin	Diameter of coin in millimetres
18.	Penny	19.05
19.	Nickel	21.21
20.	Dime	18.034
21.	Quarter	23.88

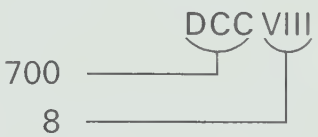
On many buildings, the date is written with Roman numerals.

1	I	50	L
4	IV	90	XC
5	V	100	C
6	VI	400	CD
9	IX	500	D
10	X	900	CM
40	XL	1000	M

Examples:



1000 + 900 + 70 + 9 = 1979



700 + 8 = 708

Write the Roman numerals.

1. 1832 **2.** 3009
3. 78 **4.** 666
5. 2404 **6.** 1930

Write the standard form.

7. MDLXXXIII
8. CCXLIX
9. XCIII
10. LXX

try this

Thinking About Estimating

How would you estimate

1. the number of hairs on your head?
2. your height a year from now?
3. the number of words in a book?
4. the number of letters on a page?
5. the number of minutes it would take you to read a book?
6. the number of seconds it would take you to copy a page?
7. the number of people in a crowd?
8. the number of birds in a flock?
9. the speed of a flying bird?
10. the length of a beetle?
11. the height of a mountain?
12. the depth of a river?
13. the number of drops of water in a pail?
14. the number of grains of sand in a pail?
15. the number of blades of grass in a football field?
16. the number of ants in an anthill?
17. the number of steps you walk in a day?
18. the length of time it would take you to climb a hill?
19. the number of streets in a city?
20. the number of sheep on a farm?
21. the distance around a large lake?
22. the number of snowflakes in a snowball?
23. the number of trees in a forest?
24. the number of animals in a forest?
25. the number of insects in a forest?

PROBLEM SOLVING

Checking Up

What does each 2 mean?

1. 372 468 500 **2.** 47 320 000 **3.** 48.02 **4.** 0.312

Write each in expanded form.

5. 672 003 040 **6.** 1 700 000 **7.** 73 055 420

Write each in standard form.

8. two hundred twenty million eighty-nine thousand

9. forty-one million one hundred seventeen thousand

10. fifteen and four-hundredths

11. seven hundred and two-thousandths

12. 700 000 000 + 90 000 000 + 4 000 000

13. 30 000 000 + 100 000 + 200

14. 4 ten millions 3 hundred thousands 6 ten thousands

15. 8 billions 5 millions 6 thousands

Write the words.

16. 0.6 **17.** 40.07 **18.** 1.203

Use $>$, $<$, or $=$ to make true statements.

19. 7 630 000 ◯ 44 630 000

20. 142 398 700 ◯ 142 398 700

21. 20 404 300 ◯ 20 440 300

22. 9 500 500 000 ◯ 9 500 050 000

List from least to greatest.

23.

63 840 200	6 850 230
6 850 320	63 804 300

List from greatest to least.

24.

35 208 600	35 270 600
35 287 600	35 287 060

Round to the

25. nearest hundred thousand.
49 980 000

26. nearest ten million.
630 400 000

27. nearest billion.
340 572 800 000

Write each using a numeral in standard form.

28. From 1968 to 1975, two million forty thousand kilograms (kg) of maple sugar were produced in Canada.

29. The value of maple syrup produced in Canada in 1975 was eleven million one hundred fifty-five thousand dollars.

2 ADDITION AND SUBTRACTION

Using Sums of 10

Anna and her friends listed the kinds of work their mothers do. How many mothers are on the list?

Education	3
Business	8
Sales	2
Health services	7
Community work	1

Add 3, 8, 2, 7, and 1.

Anna used **sums** of 10 to help her add.

$$\begin{array}{r} 3 \\ 8 \\ 2 \\ 7 \\ 1 \\ \hline \end{array} \quad 10 + 10 + 1 = 21$$

Eric added this way.

$$\begin{array}{r} 3 \\ 8 \\ 2 \\ 7 \\ 1 \\ \hline \end{array} \quad 10 + 11 = 21$$

21 mothers are on Anna's list.

Working Together

Find sums of 10.

1.	**2.**	**3.**
4	6	2
0	5	1
7	5	8
3	4	7

Add. Use sums of 10.

4.	**5.**	**6.**
5	6	4 + 4 + 1 + 0 + 2
9	3	
0	1	**7.** 5 + 8 + 2 + 3 + 7
1	2	
		8. 8 + 6 + 1 + 2 + 3

Exercises

Add. Write only the sums.

Use sums of 10 to help you add.

1. 3 5 5	**2.** 8 0 2	**3.** 7 3 4	**4.** 6 1 4
5. 5 1 9 4	**6.** 2 6 0 2	**7.** 5 7 5 2	**8.** 7 6 3
9. 8 4 2 4 2	**10.** 9 3 5 0 1	**11.** 8 7 6 4 3	**12.** 5 3 9 2 2

13. $6+4+7+1$ **14.** $3+0+7+2$ **15.** $1+1+8+1$

16. $7+5+8+2+3$ **17.** $6+9+1+4+7$ **18.** $5+2+1+3+9$

19. $5+4+9+6+0$ **20.** $1+6+2+4+7$ **21.** $8+5+1+1+7$

22. $3+2+1+8+7$ **23.** $8+5+4+5+2$ **24.** $1+8+0+9+3$

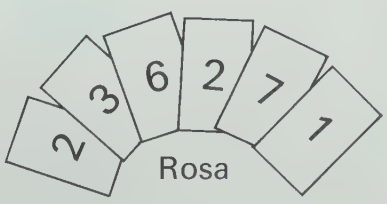
25. $7+0+8+1+5+9+2+6+3+1+5+2+0+1+4+2+4+1+5$

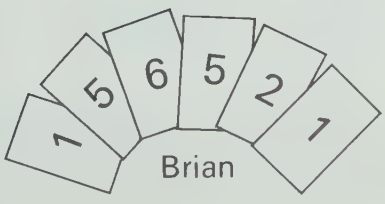
Solve.

26. The flight crew on an airplane has 3 pilots, 1 supervisor, 9 attendants, and 1 purser. How many are in the crew?

27. 4 assistant accountants, 7 tellers, 5 accounting clerks, 3 typists, 1 assistant manager, and 1 manager work at a bank. How many work at the bank?

28. In this card game the players tried to find groups of cards having a sum of 10. What groups can you find in each hand?





Adding Two Numbers

In one week, 21 768 bicycles were made in a factory.
The next week, 23 361 bicycles were made. How many bicycles were made in the two weeks?

Add 21 768 and 23 361.

```
 2 1 7 6 8
 2 3 3 6 1
 ---------
         9
```
Show the **addends** in **vertical form**.
Add ones.

```
     1
 2 1 7 6 8
 2 3 3 6 1
 ---------
     2 9
```
Add tens.
Regroup 12 tens as 1 hundred 2 tens.

```
   1 1
 2 1 7 6 8
 2 3 3 6 1
 ---------
   1 2 9
```
Add hundreds.
Regroup 11 hundreds as 1 thousand 1 hundred.

```
   1
 2 1 7 6 8
 2 3 3 6 1
 ---------
 5 1 2 9
```
Add thousands.

```
 2 1 7 6 8
 2 3 3 6 1
 ---------
 4 5 1 2 9
```
Add ten thousands.

45 129 bicycles were made in the two weeks.

To estimate the number of bicycles made, round each addend to the nearest thousand and add.

21 768 → 22 000
23 361 → 23 000
45 000

The sum is about 45 000.

About 45 000 bicycles were made in two weeks.

Working Together

Add by following the steps.

1.

```
  41 872
+ 38 659
```

Add ones and regroup.
Add tens and regroup.
Add hundreds and regroup.
Add thousands and regroup.
Add ten thousands.

Round to the nearest thousand.

2. 6532

3. 2342

Estimate each sum.

4.
```
  726
+ 573
```

5.
```
  68 928
+  1 630
```

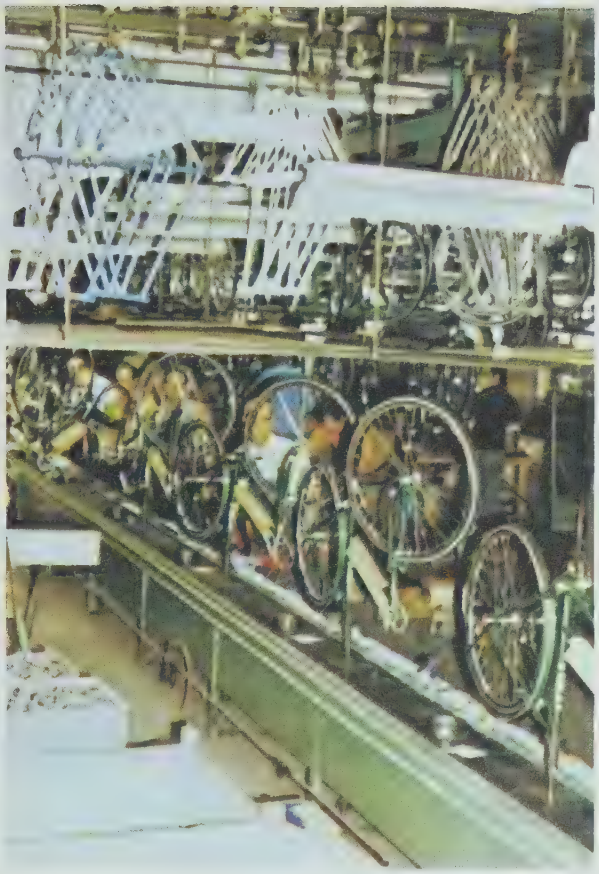
Round and add to estimate each sum. Then find the exact sum.

6.
```
  63 215
+ 24 103
```

7.
```
  $436.58
+   54.90
```

8. 7 850 + 84 265

9. $39 876 + $72 364



Exercises

Round and add to estimate each sum. Then find the exact sum.

1. 1841
5746

2. 3279
3805

3. 2657
4379

4. 6284
395

5. 4679
8773

6. 4536
9886

7. 81 214
7 051

8. 980 246
89 667

9. $859 673
349 528

10. $26 539
28 934

11. $873.09
589.37

12. $9568.96
8594.66

Solve.

13. Ingrid's bicycle cost $139.95. Her sister's bicycle cost $119.94. How much did the two bicycles cost together?

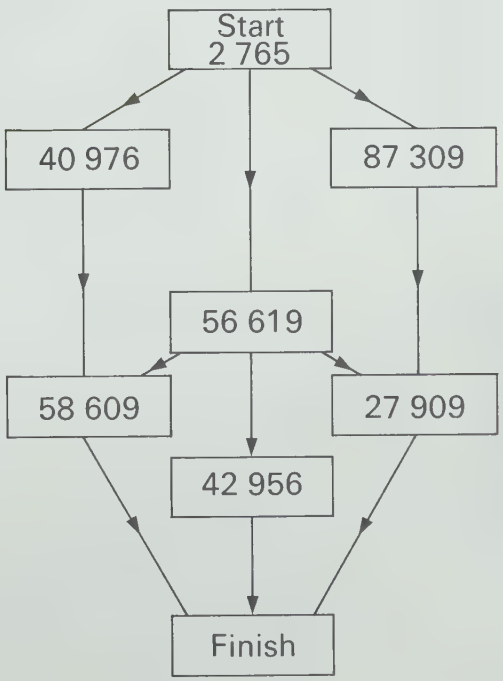
14. A store sold 3267 ten-speed bicycles and 1398 five-speed bicycles one year. How many of these kinds of bicycles did it sell in that year?

15. Noel has a ten-speed bicycle that cost $149.95. His brother has a coaster bicycle that cost $79.95. How much did the two bicycles cost together?

Copy the diagram and color a path

16. red for the numbers that have the sum 102 350.

17. blue for the numbers that have the sum 117 983.



Adding More Than Two Numbers

The catch of eels was 91 t for Prince Edward Island, 25 t for Nova Scotia, 119 t for New Brunswick, and 12 t for Newfoundland. How many tonnes of eels were caught in all?

The symbol t stands for **tonne**.

1 t = 1000 kg

	1	
	9	1
	2	5
1	1	9
	1	2
		7

Show the addends in vertical form.
Add ones.
Regroup 17 ones as 1 ten 7 ones.

Remember to watch for sums of 10.

1	1	
	9	1
	2	5
1	1	9
	1	2
	4	7

Add tens.
Regroup 14 tens as 1 hundred 4 tens.

1	1	
	9	1
	2	5
1	1	9
	1	2
2	4	7

Add hundreds.

247 t of eels were caught in all.

Working Together

Add by following the steps.

1.

325
473
869
417

Add ones and regroup.
Add tens and regroup.
Add hundreds.

Add.

2.

24 565
61 830
50 324
67 245
31 978

3.

$32.48
0.73
81.21
0.06
3.27

4. 2 568 + 792 + 36 520 + 15 + 4

5. 25 + 6 249 + 312 + 32 701

Exercises

Add.

Remember to watch for sums of 10.

1.	2.	3.	4.	5.
341	445	2069	32 421	$8403
826	69	5347	593	6569
519	251	6203	10 987	2427
		5672	4 389	5521

6.	7.	8.	9.	10.
29 031	24 692	30 456	63 789	$890.32
11 094	61 345	125	6 037	8.47
24 570	98	80 747	27 822	29.81
69 308	27 352	24 813	961	0.54
70 541	6 513	71 635	98 331	612.36

11. 4987 + 6153 + 8523 + 2641

12. 87 + 59 246 + 103 + 8

13. $372 + $49 + $3826 + $3 + $53

14. $5.63 + $0.92 + $84.71 + $0.08

This chart shows the catch in tonnes for 1976.

	Prince Edward Island	Nova Scotia	New Brunswick	Newfoundland
Cod	1 880	50 952	3 938	119 565
Haddock	27	19 001	42	249
Mackerel	1 363	7 984	656	5 350
Herring	667	96 286	75 296	48 921
Eels	91	25	119	12
Scallops	1 480	89 572	1 250	30
Lobsters	3 858	5 904	2 755	2 255
Crabs	6	499	6 172	2 666

15. How many tonnes of scallops were caught in all?

16. What was the total catch for New Brunswick?

17. What was the catch of haddock and herring for Newfoundland and Nova Scotia together?

18. How many tonnes of lobsters and crabs were caught in all?

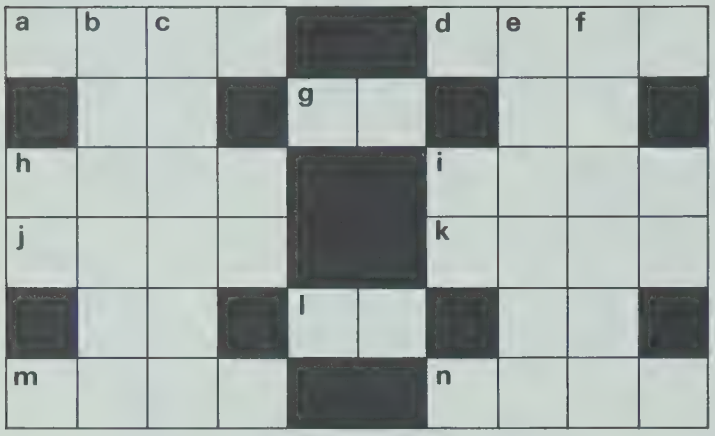
19. Which kind of fish gave the heaviest catch in all?

20. Which province had the greatest catch?

Practice

Copy and complete this puzzle.

1.



Across

a. 336 + 487 + 362 + 143
d. 5704 + 2193 + 1246
g. 4 + 8 + 1 + 1 + 6
h. 23 + 746 + 1809 + 4
i. 483 + 7 + 2061 + 625
j. 755 + 123 + 435
k. 98 + 513 + 64 + 489
l. 2 + 5 + 7 + 3 + 5
m. 1676 + 5 + 320 + 14
n. 944 + 136 + 7 + 7120

Down

b. 67 328 + 59 240 + 70 375 + 34 732 + 93 715
c. 50 436 + 89 673 + 48 734 + 59 328
e. 47 389 + 6 422 + 37 591 + 5 267 + 4 493
f. 57 326 + 81 784 + 99 387 + 76 021 + 93 152

Remember to watch for sums of 10 to help you add.

First, estimate the sum without doing any work on paper. Then add. Compare the sum with your estimate.

2. $35 805
64 942

3. $475 634
419 287

4. $154 462
783 668

5. $637.59
196.74

6. $684.32
758.79

Use $<$, $>$, or $=$ to make true statements.

7. 7 + 9 + 3 + 1 + 2 + 5 + 9 ◯ 6 + 5 + 3 + 4 + 3 + 6 + 8
8. 5 + 7 + 4 + 8 + 3 + 1 + 8 ◯ 9 + 4 + 0 + 9 + 5 + 9
9. 46 789 + 26 411 + 16 676 ◯ 54 367 + 8 245 + 27 364
10. 98 521 + 67 584 + 52 863 ◯ 95 770 + 73 312 + 48 886
11. $89 632 + $42 759 + $73 401 ◯ $43 849 + $76 214 + $85 719
12. $780.97 + $463.52 + $791.28 ◯ $779.11 + $988.40 + $268.26

Distances in British Columbia Measured in Kilometres

Dawson Creek	937	412	1143	1061	533	1194	1239	652
Kamloops		525	1255	183	404	425	460	285
Prince George			731	649	117	792	827	240
Prince Rupert				1379	851	1522	1558	970
Princeton					526	288	323	407
Quesnel						671	707	119
Vancouver							68	552
Victoria								587
Williams Lake								

This chart shows that the distance between Kamloops and Vancouver is 425 km.

Solve.

13. Jason drove from Victoria to Vancouver and then from Vancouver to Prince George. How far did he drive?

14. Adrian's father drove from Kamloops to Quesnel and from Quesnel to Williams Lake. Then he returned to Kamloops. How far did he travel?

15. Jane Berry lives in Victoria. She is planning a trip to Kamloops and then to Dawson Creek before returning home. How far will she travel on the trip?

16. How far is it in all from Prince Rupert to Princeton to Prince George to Quesnel to Dawson Creek to Prince Rupert?

*__17.__ Use an atlas or a road map. Find one of the places named in the chart above. Plan a trip to four of the other places named. Tell how far you would travel in all.

Subtraction with No Regrouping

A pet store had 256 goldfish. 145 were sold. How many goldfish are left?

Subtract 145 from 256.

Show 256 – 145 in vertical form. Subtract ones.

$$\begin{array}{r} 256 \\ -\ 145 \\ \hline 1 \end{array}$$

Subtract tens.

$$\begin{array}{r} 256 \\ -\ 145 \\ \hline 11 \end{array}$$

Add to check.

Subtract hundreds.

$$\begin{array}{r} 256 \\ -\ 145 \\ \hline 111 \end{array} \qquad \begin{array}{r} 111 \\ 145 \\ \hline 256 \end{array}$$

111 goldfish are left.

This number should match the first number used in the subtraction. If the two numbers do not match, there is a mistake in your work.

Working Together

Subtract by following the steps.

Add to check the subtraction.

1. $\begin{array}{r} 5984 \\ -\ 3721 \\ \hline \end{array}$

Subtract ones.
Subtract tens.
Subtract hundreds.
Subtract thousands.

2. $\begin{array}{r} 47\,369 \\ -\ 44\,136 \\ \hline 3\,233 \end{array}$ → ▮▮▮▮

Subtract. Add to check.

3. $\begin{array}{r} 974 \\ -\ 202 \\ \hline \end{array}$

4. $\begin{array}{r} \$8397 \\ -\ 8041 \\ \hline \end{array}$

5. 68 951 – 14 650

6. \$378.65 – \$360.54

Exercises

Subtract. Add to check.

1. 74
30

2. 683
652

3. 942
340

4. 5168
2143

5. 27 469
27 308

6. 97 685
92 360

7. 59 362
47 151

8. 90 835
10 231

9. $49 876
25 212

10. $678.39
157.02

11. 895 – 403

12. 5978 – 5608

13. 9427 – 4123

14. 88 516 – 70 214

15. 78 941 – 65 930

16. 467 981 – 234 511

17. $7278 – $7026

18. $57 982 – $35 342

19. $988.64 – $427.01

20. $792.94 – $201.50

Solve.

21. 55 guppies are in an aquarium. 41 guppies are in another. How many fewer guppies are in the second aquarium?

22. A swordtail costs $1.99. A molly costs $1.75. How much more does the swordtail cost?

23. A store sold 102 of its 213 guppies. How many guppies are left?

24. A guppy costs $1.15. A larger guppy costs $1.98. How much less does the smaller guppy cost?

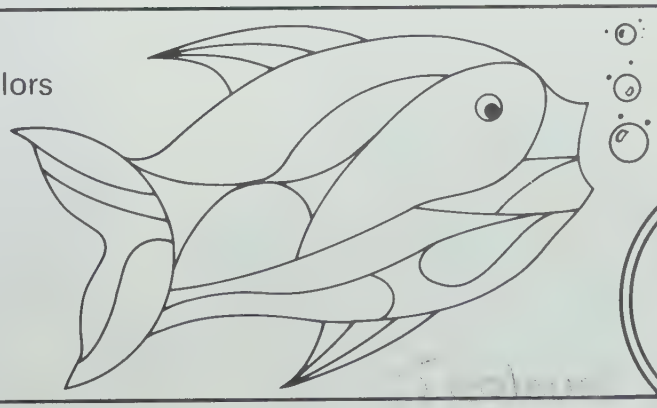
Copy and complete this chart.

25.

+	9		6		18		
	25			39			
7							
			14				
			21				33
		32			38		
				46		47	
	40						

Trace the fish.
Color it using as few colors as possible so that no touching sections are the same color.

How many colors did you need?



try this

Subtraction with Regrouping

In a ten-year period, the number of farms in Manitoba decreased from 39 747 to 29 963. How many fewer farms were there at the end of the ten years?

Subtract 29 963 from 39 747.

```
3 9 7 4 7
2 9 9 6 3
        4
```

Show 39 747 − 29 963 in vertical form.
Subtract ones. Then try to subtract tens.

```
     6 14
3 9 7 ~~4~~ 7
2 9 9 6 3
      8 4
```

To subtract tens, regroup
7 hundreds 4 tens as
6 hundreds 14 tens,
and subtract.

```
     16
   8 ~~9~~ 14
3 ~~9~~ 7 ~~4~~ 7
2 9 9 6 3
    7 8 4
```

To subtract hundreds, regroup
9 thousands 6 hundreds as
8 thousands 16 hundreds,
and subtract.

```
   18 16
 2 ~~8~~ ~~9~~ 14
~~3~~ ~~9~~ 7 ~~4~~ 7
2 9 9 6 3
  9 7 8 4
```

To subtract thousands, regroup
3 ten thousands 8 thousands as
2 ten thousands 18 thousands,
and complete the subtraction.

There were 9784 fewer farms.

To estimate the **difference**, round each number to the nearest thousand and subtract.

39 747 ⟶ 40 000
29 963 ⟶ 30 000
10 000

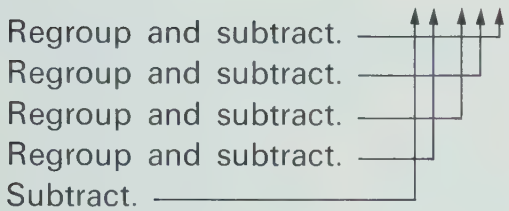
The difference is about 10 000.

There were about 10 000 fewer farms.

Working Together

Subtract by following the steps.

1. 65 327
29 658



Estimate the difference.

2. 58 364 – 17 431

Round and subtract to estimate each difference. Then find the exact difference.

3. 93 641
47 237

4. $14 595
5 096

5. $512.65 – $494.37

Exercises

Round and subtract to estimate each difference. Then find the exact difference.

1. 8746
6391

2. 4532
2815

3. 73 851
50 141

4. 83 975
48 320

5. 964 394
915 676

6. $11 842
6 348

7. $56 829
18 998

8. $939 539
764 579

9. $924.81
879.85

10. $262.10
69.47

This chart shows the change in the number of farms in the Prairie Provinces.

	Number of farms		
	1966	1971	1976
Manitoba	39 747	34 981	29 963
Saskatchewan	85 686	76 970	69 578
Alberta	69 411	62 702	57 310

11. What was the decrease in the number of farms in Alberta from 1966 to 1976?

12. In 1976, how many more farms were in Alberta than in Manitoba?

13. What was the decrease in the number of farms in Saskatchewan from 1966 to 1971?

14. In which province was the decrease in the number of farms greatest from 1971 to 1976?

15. Was the decrease in the number of Alberta farms greater from 1966 to 1971 or from 1971 to 1976?

*__16.__ How many farms do you think there will be in Saskatchewan in 1981?

Subtraction, Regrouping with Zeros

Find the difference of 19 274 and 30 000.

30 000 Cannot subtract
19 274 4 ones from 0 ones.

Think
30 000 shows 3 ten thousands.
30 000 shows 30 thousands.
30 000 shows 300 hundreds.
30 000 shows 3000 tens.

2 9 9 9 10
~~30 000~~
19 274

Regroup
3000 tens 0 ones as
2999 tens 10 ones.

2 9 9 9 10
~~30 000~~
19 274
10 726

Then,
subtract ones, tens,
hundreds, thousands,
and ten thousands.

The difference is 10 726.

Here are some other examples that show regrouping with zeros.

3 10 2 9 15 ~~4 0 3 0 5~~ 1 7 2 9 7 2 3 0 0 8	16 13 5 ~~6~~ 9 ~~3~~ 17 ~~6 7 0 4 7~~ 3 9 6 5 8 2 7 3 8 9
12 1 ~~2~~ 9 9 10 ~~2 3 0 0 0~~ 1 5 6 8 4 7 3 1 6	10 12 5 ~~0~~ 9 ~~2~~ 10 ~~6 1 0 3 0~~ 1 2 7 3 9 4 8 2 9 1

Working Together

Copy and complete.

1. 3 9 9 9 15
~~4 0 0 0 5~~
1 9 3 2 6

2. 7 10
7 0 ~~0~~ ~~0~~
2 4 3 9 7

Subtract.

4. 304
156

5. 52 000
49 617

6. 80 014 − 7 268

7. 10 000 − 5 093

Subtract by following the steps.

3. 60 203
54 987

Regroup and subtract.
Subtract.
Regroup and subtract.
Subtract.
Subtract.

Exercises

You can check the subtraction by adding or by estimating.

Subtract.

1. 600 327	**2.** 501 289	**3.** 5030 384	**4.** 9005 8636	**5.** $8300 1979
6. 64 031 44 907	**7.** 80 303 45 715	**8.** 71 007 3 948	**9.** 90 000 45 107	**10.** $400.30 375.68

11. 70 806 − 69 745 **12.** 30 106 − 26 248 **13.** $40 906 − $6 549

14. 740 000 − 311 920 **15.** 950 001 − 812 086 **16.** $270.09 − $78.54

15 002 people are employed for a mine in Quebec. 3365 of them are miners. 4103 people process the metal. 771 people work in the laboratories. There are 1603 people in the office for the mine and 5160 work on maintenance and construction.

Solve.

17. How many of the people employed for the mine are not miners?

18. How many more people work in the office than in the laboratories?

19. How many fewer people process the metal than work in maintenance and construction?

20. What is the difference of the numbers for the largest group of employees and the smallest group of employees?

21. If 8 people stopped working in the office, how many would be left in the office? How many people would still be employed by the mine?

Practice

First, estimate the difference without doing any work on paper. Then subtract. Compare the difference with your estimate.

1. 5837 1820	**2.** 2462 1959	**3.** 17 634 8 967	**4.** $68 521 39 407	**5.** $434.20 346.86
6. 90 000 7 603	**7.** 206 034 156 849	**8.** 500 818 424 967	**9.** $80 007 49 129	**10.** $509.00 217.50

Copy and complete.
Add across. Subtract down.

11.

	+	
48 736	40 497	
27 940	38 763	

(−)

12.

	+	
50 000	30 700	
12 847	28 362	

(−)

This block is a check.

13.

	+	
24 004	48 074	
19 876	15 784	

(−)

14.

	+	
50 738	40 086	
42 474	24 296	

(−)

Ida and Al played a game of X's and O's.
Each exercise with a difference greater than 32 352 shows where Ida placed an X.
Each exercise with a difference less than 32 352 shows where Al placed an O.
Each exercise with a difference of 32 352 shows where there was neither an X or an O.

36 035 − 3 483	70 101 − 37 749	60 060 − 27 908
51 037 − 19 775	66 300 − 34 047	90 001 − 57 649
74 010 − 40 668	48 043 − 15 591	81 234 − 48 783

15. Copy the diagram and find the differences.

16. Who won the game?

Solve.

17. There were 87 603 logs at a pulp mill until 27 795 logs were made into pulp. How many logs were left at the mill?

18. The number of logs at a pulp mill was 29 765. Then 83 719 more logs came and 49 695 logs were cut into boards. How many logs remained?

	Number of employees	
	1970	1975
Saw mills	42 540	40 788
Logging	44 814	45 533

19. How many more people were employed in logging in 1975 than in 1970?

20. How many fewer people were employed in saw mills in 1975 than in 1970?

21. In 1975, how many more people were employed in logging than in saw mills?

When there are two **operations**, **parentheses** tell which operation comes first.

first
$(13 - 7) + 5 = 11$
$13 - (7 + 5) = 1$
first

Work inside the parentheses first. Then work from left to right.

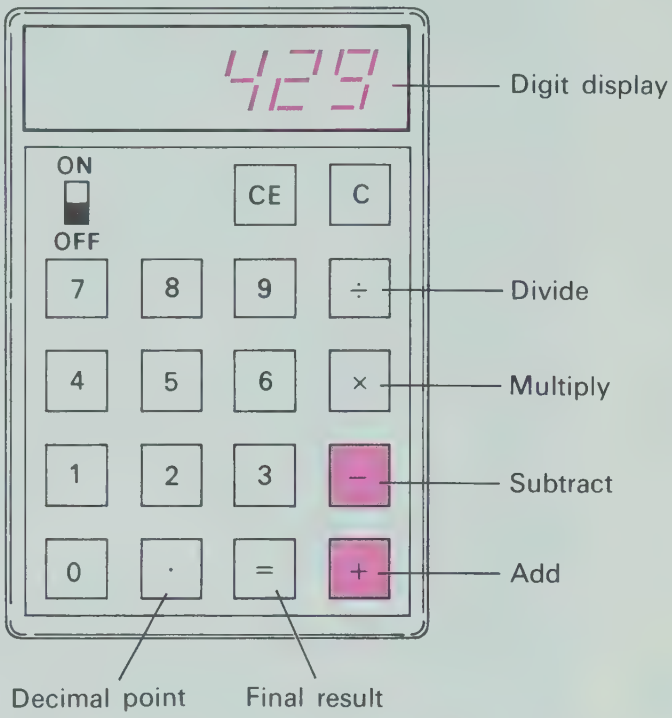
1. $(472 + 4836) + 2764$
2. $472 + (4836 + 2764)$
3. $(2000 - 728) - 649$
4. $2000 - (728 - 649)$
5. $(6598 + 9321) - 1728$
6. $6598 + (9321 - 1728)$
7. $(13\,095 - 5\,231) + 6\,893$
8. $13\,095 - (5\,231 + 6\,893)$
9. $18\,002 - (7\,904 - 5\,962) + 961 - (6\,005 - 437)$

try this

Using a Calculator to Add or Subtract

A calculator can be used to find answers quickly.

To use a calculator, you need to know which keys to press.



Calculator keys are not always in the same place on different calculators.

How would you use a calculator to find the number of tractors used on farms in Canada in 1971?

I would add the numbers in the column for tractors using the [+] key and the [=] key.

This table shows the farm machines used in Canada in 1976.

	Trucks	Tractors	Combines	Swathers	Hay balers	Forage crop harvesters
Nfld.	411	429	1	6	108	13
P.E.I.	3 369	5 366	1 248	121	1 834	353
N.S.	3 916	5 631	310	170	2 005	368
N.B.	3 991	5 862	759	263	1 953	324
Que.	21 713	80 017	5 925	6 719	30 012	5 979
Ont.	73 374	165 623	24 914	11 598	37 481	15 674
Man.	48 323	65 176	23 174	23 526	13 950	1 569
Sask.	140 684	139 487	61 126	62 544	30 860	3 275
Alta.	109 694	116 316	42 689	43 944	31 093	5 099
B.C.	17 106	21 352	1 704	3 119	4 927	2 062

How would you use a calculator to find the answers to each of these questions for farms in Canada in 1976?

1. the number of farm machines in Quebec

2. how many fewer combines there were in Manitoba than in Alberta

3. the number of hay balers in Ontario, Saskatchewan, and British Columbia

4. the difference of the number of combines and the number of forage crop harvesters

5. the number of hay balers and swathers in Newfoundland and Prince Edward Island together

6. the difference of the numbers of farm machines in Nova Scotia and in New Brunswick

7. the province with the most farm machines

8. the number of trucks

9. the number of farm machines

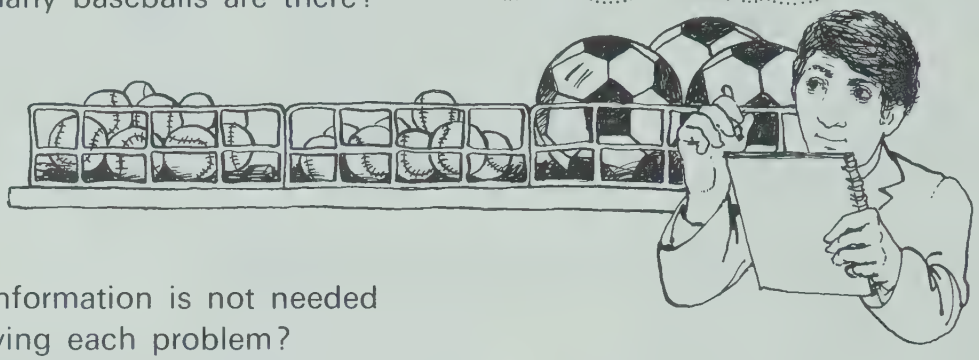
Calculator

Too Much Information

Sometimes there is more information than is needed for solving a problem.

Mr. Da Costa is counting
the stock in his sports store.
He counted 87 baseballs
of one type, 12 of another,
38 of another, and
33 soccer balls.
How many baseballs are there?

This is not needed
for solving the problem.



What information is not needed
for solving each problem?

1. Kevin saved $53.50. He bought a volleyball for $28.99 and a volleyball net for $15.98. He plans to buy a soccer ball for $8.98. How much did he spend?

2. Mr. Da Costa had 75 tennis rackets. He sold 27 for $19.95 each and 32 for $25.95 each. Then he bought 17 more. How many did he have then?

3. Carla went to five stores looking for a basketball. She bought one that regularly cost $12.95, but was on sale for $9.99. She also bought a basketball hoop for $5.98. How much less did she spend because of the sale?

4. Mr. Da Costa has 213 pairs of one type of hockey skates and 394 of another. He also has 412 pairs of one type of figure skates and 362 of another. How many pairs of hockey skates are there?

5. Mr. Da Costa had 76 badminton rackets. He sold 35 of them in April and 21 in May. The others are on sale for $14.99. How many are left?

6. The store opens at 9:00 a.m. every day except Sunday. It closes at 6:00 p.m. on Monday, Tuesday, Wednesday, and Saturday, at 8:00 p.m. on Thursday, and at 9:00 p.m. on Friday. How many more hours is it open on Friday than on Tuesday?

PROBLEM SOLVING

Checking Up

Add.

1. 5 + 2 + 6 + 5

2. 8 + 7 + 3 + 4

3. 5 + 9 + 4 + 1 + 6

4. 3 + 6 + 4 + 3 + 7

5. 8 + 5 + 4 + 7 + 6

6. 3 + 4 + 9 + 3 + 5

7. 2 + 0 + 9 + 8 + 1

8. 435 + 162

9. 1043 + 3982

10. 52 478 + 39 618

11. \$79 365 + 28 796

12. \$648.37 + 892.97

13. 722 + 834 + 586 + 535

14. 139 + 72 + 238 + 4709

15. 23 540 + 19 207 + 8 496 + 32 + 72 412

16. 12 004 + 18 937 + 5 343 + 894 + 5 712

17. \$473.68 + 315.20 + 306.42 + 425.19 + 752.24

Subtract.

18. 837 − 425

19. 7542 − 6930

20. 56 473 − 8 192

21. \$24 364 − 17 509

22. \$634.20 − 487.63

23. 60 000 − 2 749

24. 50 604 − 45 786

25. 74 003 − 72 107

26. \$20 004 − 9 795

27. \$800.50 − 432.66

Find the result.

28. \$68 735 + \$37 396

29. \$542.83 − \$7.86

30. 43 021 − 2 986

31. 45 + 338 + 4 692 + 7 + 68 115

Solve.

32. There are 15 007 tickets for a circus. How many tickets are left after 8529 are sold?

33. An artist sold one painting for \$769.50 and another for \$176.75. How much did the artist receive for the two paintings?

34. A library signed out 2538 items on Tuesday, 997 on Wednesday, 1642 on Thursday, 3578 on Friday, and 6013 on Saturday. How many items did the library sign out that week?

35. 1674 of the 5106 employees at a hospital are nurses. How many of the employees are not nurses?

3 GRAPHING

Organizing Information

Reginald spent a day at the airport counting the number of airplanes from each airline.

He made a **tally chart** to show the information.

In another chart, he used "Other" to group the airlines that had just one airplane landing.

Tally Chart

Airline	Tally	Number of airplanes
Air Canada	𝍸 𝍸 /	11
Air France	𝍸	5
Quebecair	///	3
CP Air	////	4
Lufthansa	/	1
Royal Air Maroc	/	1
Alitalia	//	2
Eastern Provincial	//	2
Finnair	//	2
KLM	///	3
Olympic Airways	/	1

Table of Information

Airline	Number of airplanes
Air Canada	11
Air France	5
Quebecair	3
CP Air	4
Alitalia	2
Eastern Provincial	2
Finnair	2
KLM	3
Other	3

Working Together

From Reginald's tally chart, tell

1. how many airplanes there were from Air Canada and CP Air together.
2. how many airplanes there were from the three airlines that used the airport most that day.
3. how many more airplanes there were from Quebecair than from Olympic Airways.
4. how many fewer airplanes there were from Finnair than from Air France.

From Reginald's Table of Information,

5. tell the meaning of "Other" in the "Airline" column.
6. find the number of each kind of vowel. Use a tally chart.

Exercises

Freda made a survey of the favorite sports of 29 students.

1. Count the tallies and complete her tally chart.

Sport	Tally	Number of students
Soccer	𝍸 //	7
Baseball	////	?
Hockey	𝍸 /	?
Basketball	//	?
Track	//	?
Volleyball	𝍸	?
Swimming	//	?
Other	/	?

This chart shows the marks out of 10 that the students in Nick's class received on a test.

7	7	8	4	6	9	10	5	5
8	10	2	9	0	1	7	6	7
9	7	6	8	4	4	7	6	9

2. Make a tally chart to show this information.
3. How many students had a mark of 6 or greater than 6?
4. Which mark was received most often?
5. How many more students received a mark of 9 than a mark of 8?

Jay made a survey of 31 students to find out which of the following kinds of movies they like best: science fiction, western, horror, detective, spy, or comedy.

6. On a tally chart, show what you think the result would be.
7. Use a tally chart to make a survey of the favorite kinds of movies of the students in your class.

Pictographs

One day after school, Yolanda made a survey of the traffic at the corner near her school. She made a tally chart to show the number of vehicles coming from each direction.

Direction	Tally	Number of vehicles
West	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 //	32
East	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 //	87
North	𝍸 𝍸 𝍸 𝍸 ///	23
South	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 ////	49

Then she drew a **pictograph** to show the information in a different way.

Yolanda used
to represent 3 to 7 vehicles, and
to represent 8 to 12 vehicles.

Traffic on October 1

Direction	Number of vehicles stands for 10 vehicles.
West	
East	
North	
South	

Working Together

From Yolanda's pictograph, tell

1. the direction from which the most vehicles were coming.
2. the direction from which the fewest vehicles were coming.
3. about how many vehicles were coming from the north and from the south in all.
4. about how many more vehicles were coming from the east than from the west.

Five students collect stamps. Ian has 251, Tim has 305, Hilda has 225, David has 376, and Betty has 175.

5. What symbol would you use to show this information in a pictograph?
6. Would your symbol stand for 1, 10, 50, or 100 stamps?
7. Draw the pictograph using whole symbols and half symbols.
8. Write a title for your pictograph.

Exercises

Barb drew this graph to show how many hockey cards each student has.

Person	Number of hockey cards
Gus	
Pam	
Bob	
Barb	
stands for 20 cards.	

From Barb's pictograph, find

1. who has the most hockey cards.
2. about how many hockey cards Gus has.
3. about how many hockey cards Bob and Pam have together.
4. about how many more hockey cards Bob has than Barb.

This chart shows 6 countries from which immigrants came to Canada in 1973 and 1974. Each number has been rounded to the nearest 5000.

Britain	65 000	Hong Kong	25 000
U.S.A.	50 000	India	20 000
Portugal	30 000	Jamaica	20 000

5. Draw a pictograph to show this information.

Use whole symbols and half symbols.

Make a survey to find the favorite hobbies of the students in your class.

6. Use a tally chart to collect the information.
7. Draw a pictograph to show the information.

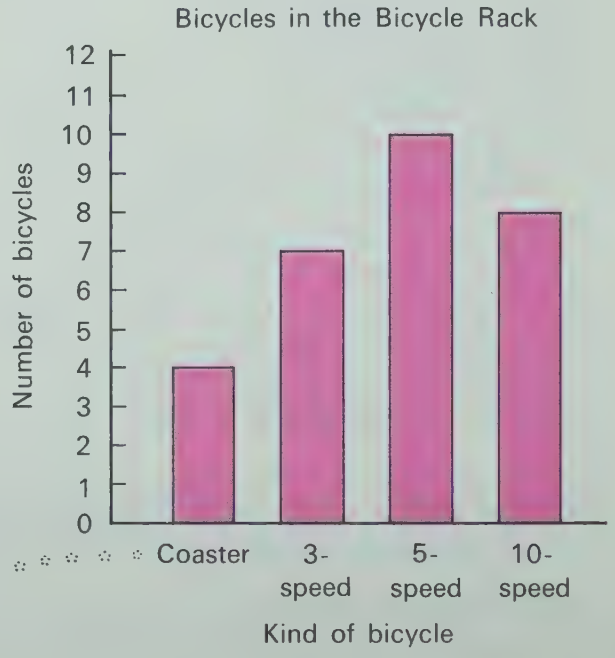
Bar Graphs

Ken counted the different kinds of bicycles in the bicycle rack.

He made a tally chart to show the number of each kind of bicycle.

Kind of bicycle	Tally	Number of bicycles
coaster	////	4
3-speed	𝍸 //	7
5-speed	𝍸 𝍸	10
10-speed	𝍸 ///	8

Then he drew a **bar graph** to show the information in a different way.



Each vertical bar stands for a different kind of bicycle.

Working Together

From Ken's bar graph, tell

1. which kind of bicycle was
   the most common.
   the least common.
2. how many more 10-speed bicycles there were than 3-speed bicycles.

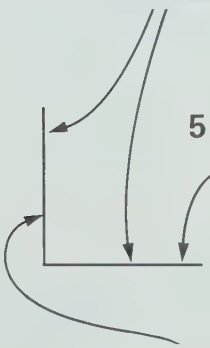
This chart shows the number of children in each of 30 units of an apartment building.

0	2	3	1	1	2	0	4	2	3
0	0	3	3	1	1	2	2	2	2
1	2	1	0	0	4	5	3	1	1

3. Make a tally chart to show this information.

To draw a bar graph using the information from your tally chart,

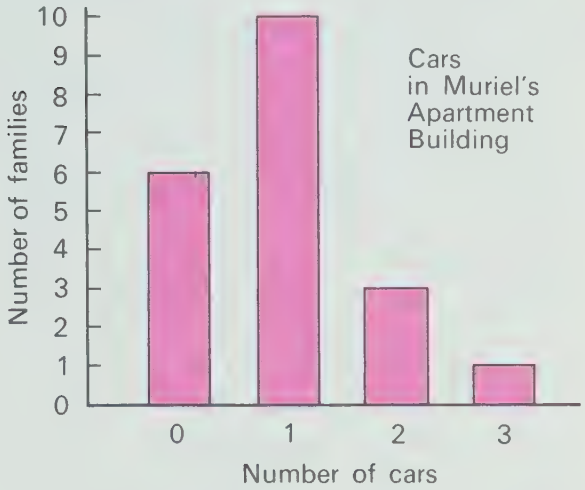
4. draw lines like this.



5. Label the horizontal line to show what it represents.
6. Label the vertical line to show what it represents.
7. On the horizontal line, place the names where you will draw the bars in your graph.
8. Mark the vertical line with numbers to let you show the information in your tally chart.
9. Complete the bar graph.
10. Write a title for your graph.

Exercises

This bar graph shows the number of cars owned by each of 20 families



From this bar graph, find

1. how many families have 1 car.
2. how many families have no cars.
3. how many families have at least 1 car.
4. how many more families have 2 cars than have 3 cars.

This tally chart shows the times at which 29 students went to bed one night.

8:30	9:00	9:30	10:00
𝍸 ////	𝍸 𝍸 //	𝍸	///

5. Draw a bar graph to show this information.

Make a survey of your classmates to find out their favorite books, TV shows, animals, or foods.

6. Use a tally chart to collect the information.
7. Draw a bar graph to show the information.

Ordered Pairs of Numbers and Points on a Grid

Each point on a grid can be matched with a pair of numbers.

To match point A with a pair of numbers, count over 3 and up 4.

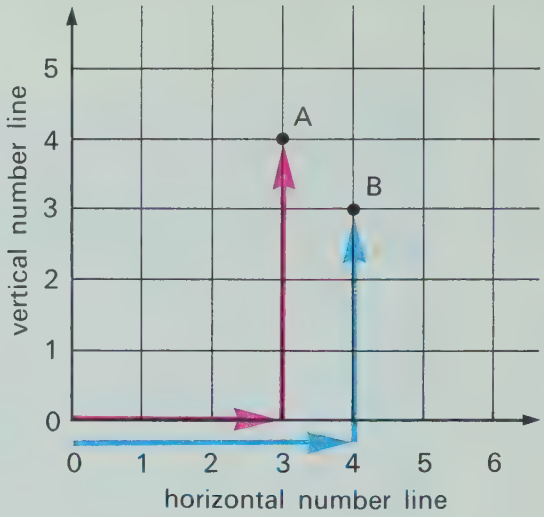
Point A matches (3, 4).

(3, 4) is an **ordered pair** of numbers.

Each ordered pair of numbers can be matched with a point on a grid.

To match the ordered pair (4, 3) with a point on the grid, count over 4 and up 3.

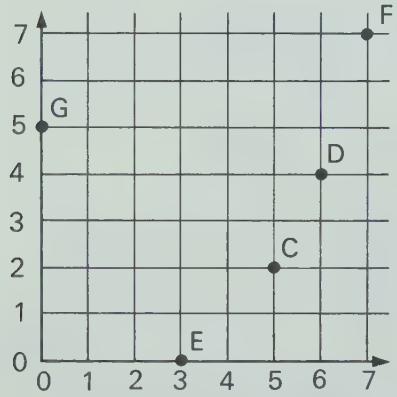
(4, 3) matches point B.



(3, 4) is the same pair of numbers as (4, 3), but it is a different ordered pair of numbers.

Working Together

For the points on this grid, complete the chart.



		Count over	Count up	Ordered pair
1.	point C	?	?	?
2.	point D	?	?	?
3.	point E	?	?	?

Give the ordered pair of numbers that matches

4. point F. **5.** point G.

Use graph paper. Draw a horizontal number line and a vertical number line starting from the same point. Then plot each of these.

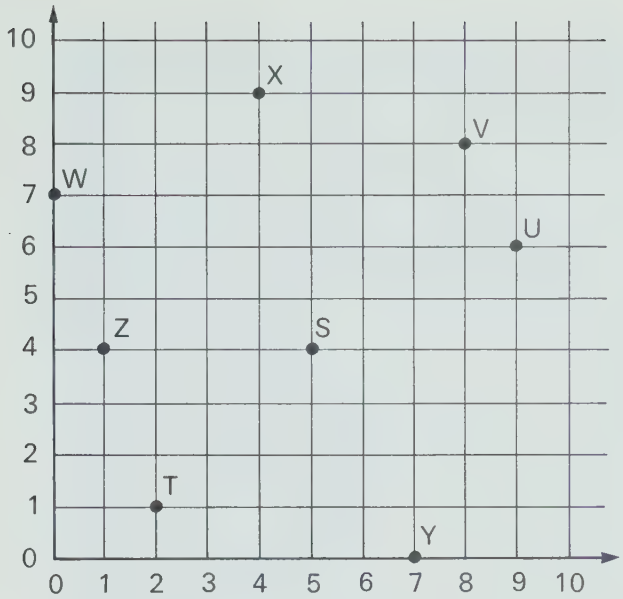
You **plot** a point when you draw a dot on a grid for an ordered pair of numbers.

6. P(5, 1) **7.** Q(1, 5) **8.** R(3, 3) **9.** S(0, 4) **10.** T(4, 0)

Exercises

Give the ordered pair of numbers that matches

1. point S.
2. point T.
3. point U.
4. point V.
5. point W.
6. point X.
7. point Y.
8. point Z.



Use graph paper. Draw a horizontal number line and a vertical number line starting from the same point. Then plot each of these.

9. A(4, 5)
10. B(7, 2)
11. C(8, 1)
12. D(9, 3)
13. E(2, 2)
14. F(3, 10)
15. G(0, 2)
16. H(2, 0)
17. J(8, 5)
18. K(5, 8)
19. L(8, 0)
20. M(6, 6)
21. N(0, 0)
22. P(0, 1)
23. Q(10, 9)

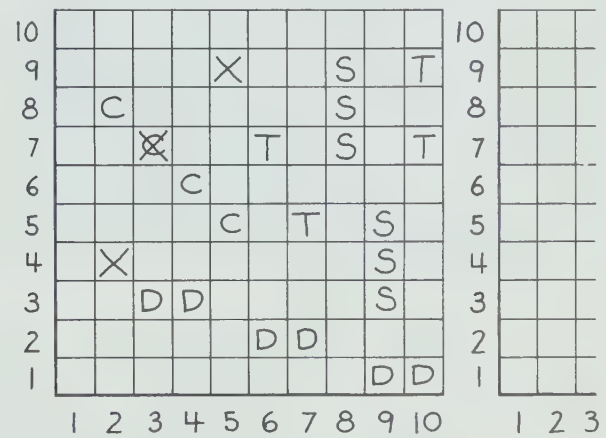
Gina and Luke each have two of these charts to play the game.

Each marks a fleet on one grid:
1 carrier (4 squares);
2 submarines (3 squares each);
3 destroyers (2 squares each); and
4 torpedo boats (1 square each).

They take turns. Each fires three shots by naming three ordered pairs. After these shots, the other player names any ships that were hit. Each uses the second grid to record the shots against the other player.

The player who names all the squares used by the other player's fleet is the winner.

Play this game with a classmate.



Luke has hit my carrier at (3, 7), but the other two shots missed.

try this

Line Graphs

Kelly and her parents went to Rome by airplane at 800 km/h (kilometres per hour).

She made a table of ordered pairs to show this information.

Number of hours	Distance in kilometres	Ordered pair
1	800	(1, 800)
2	1600	(2, 1600)
3	2400	(3, 2400)
4	3200	(4, 3200)
5	4000	(5, 4000)
6	4800	(6, 4800)

Then she drew a **line graph** to show the information.

A table of information helps to show how to mark the number lines for a line graph.

Working Together

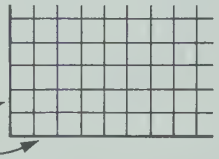
From Kelly's line graph, tell

1. how far the plane flew in 5 h (hours).
2. how long it took the plane to fly 1600 km.

Kelly saved $0.50 each week for her trip.

3. Make a table of 6 ordered pairs of numbers using this information.

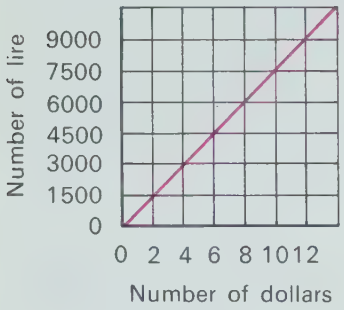
To draw a graph using the information from your table,



4. draw lines like these on graph paper.
5. Label the horizontal line to show what it represents.
6. Label the vertical line to show what it represents.
7. Mark the horizontal line with numbers that will allow you to show the information.
8. Mark the vertical line with numbers that will allow you to show the information.
9. Mark a dot to show each ordered pair. Join the dots.
10. Write a title for your line graph.

Exercises

This graph shows the number of lire Kelly received for every $2.



From this line graph, find

1. the number of lire Kelly received for $8.
2. the number of dollars that would be paid for 7500 lire.
3. how much more 4500 lire cost than 3000 lire.

For each of these, make a table of 6 ordered pairs. Then draw a line graph.

4. Christine was going to visit relatives in Greece. For every dollar, she received 30 drachmas.
5. Celia went to South Africa. For every $5, she received 4 rands.
6. Paul cycled 5 km in 25 min (minutes).
7. Jane swam 15 m (metres) in 30 s (seconds).

Add or subtract.

1.	2.	3.	4.	5.	6.
7	17	432	5089	2451	5621
3	21	234	911	2398	4130
9	59	909	555	1126	5448
3	75	682	42	3509	3956

7. 111 − 89
8. 1011 − 809
9. 11 011 − 8 909
10. 110 011 − 89 009

KEEPING SHARP

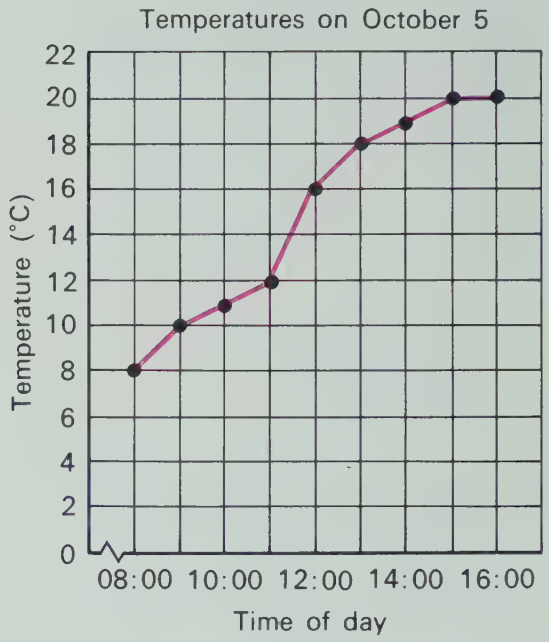
Broken-Line Graphs

On October 5, Nota's class recorded the temperature in degrees Celsius every hour from 08:00 until 16:00.

Temperatures on October 5

Time	Temperature (°C)
08:00	8
09:00	10
10:00	11
11:00	12
12:00	16
13:00	18
14:00	19
15:00	20
16:00	20

Then they drew a **broken-line graph** by plotting the points and connecting the points with line segments.



Working Together

From the broken-line graph, tell

1. the temperature at 14:00.
2. when the temperature was 12°C.

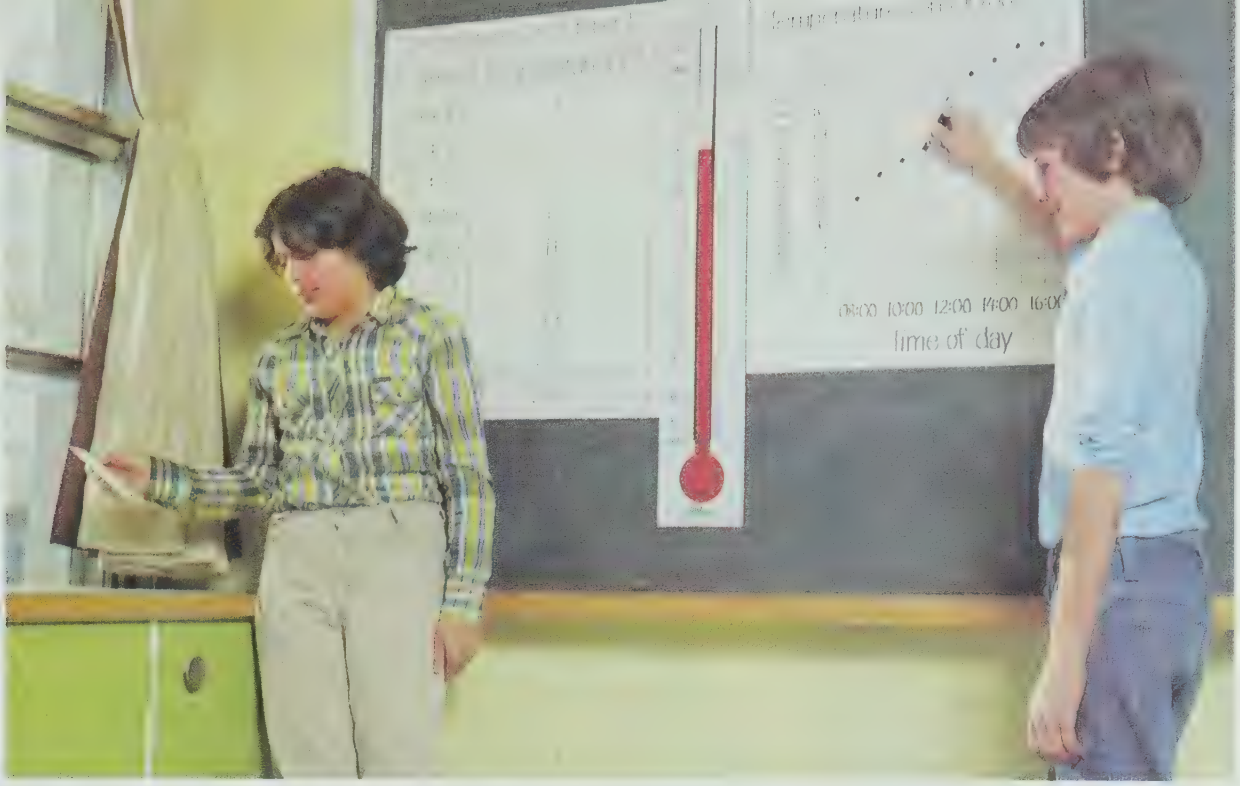
Nota recorded the temperatures from 16:00 to 22:00.

Temperatures on October 5

Time	Temperature (°C)
16:00	20
17:00	18
18:00	16
19:00	15
20:00	13
21:00	11
22:00	9

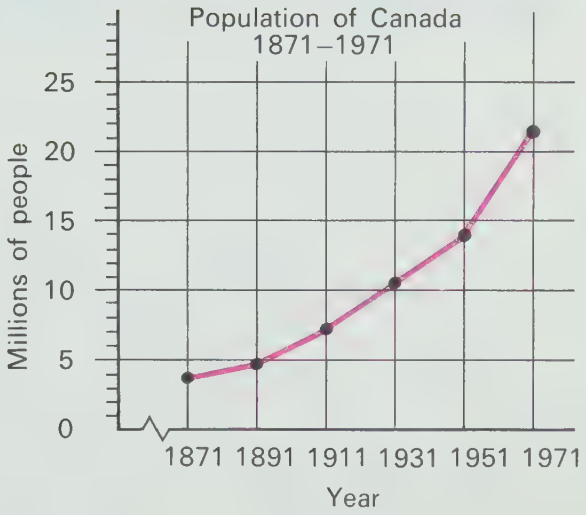
To draw a broken-line graph using Nota's information,

3. draw a horizontal line and a vertical line on graph paper starting from the same point.
4. Label the horizontal line and the vertical line.
5. Mark the lines with numbers for showing the information.
6. Mark a dot to show the temperature each hour.
7. Join the dots.
8. Write a title for the graph.



Exercises

The graph shows the population of Canada from the year 1871.



1. About how many people were in Canada in 1871?
2. About how much did the population increase from 1911 to 1931?
3. In which period did the population increase the most? the least?

*4. About how many people were in Canada when you were born?

*5. What is the population of Canada now?

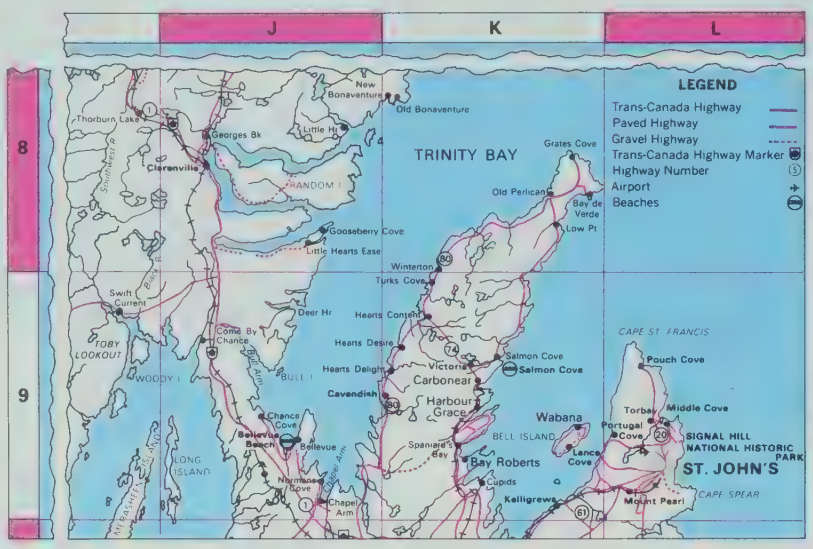
*6. What do you think Canada's population will be in 1991?

Begin a broken-line graph to show the daily outdoor temperature.

7. Show the high temperature for each day in red.
8. Show the low temperature for each day in blue.
9. Show the noon temperature for each day in green.

Finding Information

The *Index to Cities, Towns, and Settlements* that is printed with a road map of Newfoundland shows that Hearts Content can be located with the ordered pair (K, 9).



The map shows that there is something special at Salmon Cove.

The *Legend* that is printed with the map shows that ⊖ represents a beach.

Use a map of your province or territory.

1. Does it have an Index to Cities and Towns?
2. Does it use ordered pairs to help you locate places?
3. If your map uses ordered pairs for places, give the ordered pair for your capital city.
4. Find a place on your map that is close to a border and give its ordered pair.
5. Does your map have a Legend? How many items are listed in it?
6. Find an example of each item in the Legend.

Stay close to home if possible.

7. Find a provincial or national park on your map and give the ordered pair that shows where it is located.
8. Make a list of the other information that is included on your map page along with the map itself.
9. Make up a question about your map to give to a classmate.

PROBLEM SOLVING

Checking Up

This chart shows the number of students who went to each volleyball practice.

12	9	11	8	10	7	8	7
10	12	10	9	11	9	8	9
7	8	9	10	7	12	12	11

1. Make a tally chart to show how many times each number of students was at volleyball practice.

Five students collect autographs of sports stars. Jim has 57, Lynn has 71, Raymond has 44, Olive has 65, and Jessica has 39.

2. Draw a pictograph that shows this information.

This chart shows the average high temperature in degrees Celsius in Halifax for 6 months.

March	3	June	19
April	8	July	23
May	14	August	22

3. Draw a bar graph to show this information.

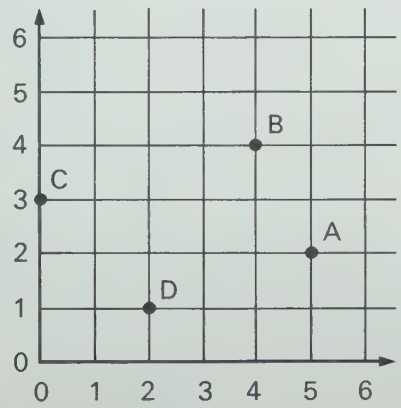
4. Draw a broken-line graph to show this information.

The price of gasoline is 30¢ for each litre.

5. Make a table of six ordered pairs of numbers using this information.

6. Draw a line graph to show this information.

For this grid, give the ordered pair matching



7. point A. **8.** point B.

9. point C. **10.** point D.

Use graph paper. Draw a horizontal number line and a vertical number line starting from the same point. Then plot each of these.

11. E (1, 3) **12.** F (4, 0)

13. G (6, 6) **14.** H (0, 0)

4 MULTIPLICATION AND DIVISION

Basic Multiplication Facts

Walter and Denise are using this chart to play the game "Lineup".

They take turns. Each names two **factors**, and then writes the **product** in the proper square. The player who first writes four products in line is the winner.

7 × 5
6 × 4
6 × 8
7 × 6
7 × 4
8 × 4
9 × 4

Second factor

First factor

×	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6								42		
7						35				
8										
9										

6 × 7
6 × 6
6 × 5
8 × 6
7 × 7
7 × 3
5 × 4

Who won the game?
Who do you think had the first turn?

Exercises

Who won each game?
Who do you think had the first turn?

1.

Denise	Walter
0×8	6×2
1×7	5×3
4×4	7×1
8×0	3×5
5×4	6×4
6×3	7×5
8×6	4×2

2.

Denise	Walter
8×6	7×3
9×6	8×4
7×6	6×6
9×5	6×2
5×1	7×5
9×3	5×7

3.

Denise	Walter
2×2	1×3
3×3	2×3
1×1	4×4
3×2	0×0
3×4	4×2
3×1	3×5

Copy and complete.

4.

×	0	1	2	3	4	5	6	7	8	9
8										

5.

×	4	9	2	0	5	7	1	6	3	8
6										

6.

×	8	2	7		4	6	9		3	5
7				0				7		

7.

×	2	9	5	8	0			3	1	
9						63	36			54

Multiply.
Write only the products.

8. 7×4
9. 8×8
10. 9×3
11. 7×9
12. 2×0
13. 1×4
14. 8×3
15. 9×9

16. $\begin{array}{r} 8 \\ \times\ 7 \\ \hline \end{array}$
17. $\begin{array}{r} 5 \\ \times\ 2 \\ \hline \end{array}$
18. $\begin{array}{r} 9 \\ \times\ 8 \\ \hline \end{array}$

19. $\begin{array}{r} 0 \\ \times\ 0 \\ \hline \end{array}$
20. $\begin{array}{r} 8 \\ \times\ 5 \\ \hline \end{array}$
21. $\begin{array}{r} 5 \\ \times\ 4 \\ \hline \end{array}$

22. $\begin{array}{r} 7 \\ \times\ 7 \\ \hline \end{array}$
23. $\begin{array}{r} 4 \\ \times\ 8 \\ \hline \end{array}$
24. $\begin{array}{r} 5 \\ \times\ 5 \\ \hline \end{array}$

Complete each of these in
as many ways as possible.

25. $3 \times 3 = \square$
26. $\square \times 6 = 24$
27. $\square \times \square = 8$
28. $\square \times 5 = 0$
29. $\square \times \square = 1$
30. $9 \times \square = 8$
31. $\square \times 5 = \square 5$
32. $4 \times \square = \square 6$
33. $8 \times \square = 4\square$
34. $\square \times 6 = \square 2$
35. $\square \times 2 = 1\square$
36. $\square \times 9 = 9$
37. $7 \times \square = 4\square$
38. $\square \times 6 = 3\square$
39. $\square \times 3 = 1\square$
40. $8 \times \square = \square 4$
41. $\square \times \square = 63$
42. $\square \times 7 = \square 6$
43. $8 \times \square = 7\square$
44. $6 \times \square = 5\square$
45. $\square \times 3 = \square 1$
46. $4 \times \square = 2\square$

47. Play "Lineup" with a friend.

Multiplying by a One-Digit Number

375 mL (millilitres) of mashed bananas are needed for a loaf of banana bread. How many millilitres of mashed bananas are needed for 6 loaves?

Multiply 6 and 375.

hundreds	tens	ones	
	3		
3	7	5	
		6	$6 \times 5 = 30$ or 3 tens 0 ones.
		0	

4	3		
3	7	5	
		6	6×7 tens $= 42$ tens 3 more tens make 45 tens or 4 hundreds 5 tens.
	5	0	

4	3		
3	7	5	
		6	6×3 hundreds $= 18$ hundreds 4 more hundreds make 22 hundreds or 2 thousands 2 hundreds.
2	2	5	0

2250 mL of mashed bananas are needed for 6 loaves of banana bread.

Working Together

Multiply by following the steps.

1. 76 953 × 7

Multiply. Regroup.
Multiply. Add. Regroup.
Multiply. Add. Regroup.
Multiply. Add. Regroup.
Multiply. Add.

Multiply.

2. 3041 × 5

3. 48 007 × 8

4. 4×7490

5. $50\,806 \times 9$

Banana Bread

125 mL brown sugar
2 eggs
75 mL corn oil
50 mL orange juice
500 mL flour
5 mL salt
2 mL baking soda
10 mL baking powder
375 mL mashed ripe bananas
150 mL chopped walnuts
200 mL raisins
5 mL grated orange rind

Beat eggs and sugar until light and fluffy. Stir in corn oil and orange juice.

Sift together flour, salt, baking soda, and baking powder.

Add dry ingredients alternately with bananas, beating slightly after adding each. Fold in nuts, raisins, and orange rind.

Bake at 180°C about 45 min.

Exercises

Multiply.

1. 421 × 2

2. 6130 × 3

3. 5271 × 4

4. 81 526 × 3

5. 47 650 × 6

6. 45 607 × 8

7. 7081 × 7

8. 50 091 × 6

9. 10 509 × 5

10. 68 004 × 9

11. 4 × 9403

12. 13 657 × 9

13. 7 × 50 237

14. 8 × 80 792

15. 6002 × 6

16. 9 × 32 009

17. 5 × 20 878

18. 80 911 × 8

Use the recipe for banana bread to solve each of these.

19. How many millilitres of raisins are needed for 4 loaves?

20. How much orange juice would be used for 7 loaves?

21. How many millilitres of flour are needed for 9 loaves?

22. How much corn oil would be used for 3 loaves?

23. How many millilitres of chopped walnuts would be in 2 loaves?

24. How many millilitres of brown sugar are needed for 8 loaves?

25. Write the amount of each ingredient needed for 5 loaves.

Multiplying by Multiples of 10, 100, and 1000

Alana helped her parents wallpaper their living room and dining room. They used 20 rolls of wallpaper. Each roll cost $17. How much did the wallpaper cost?

Multiply 20 and 17.

For the product

$$\begin{array}{r} 17 \\ \underline{20} \end{array}$$

2 tens 0 ones

you need to know how to multiply 0 and 17,

$$\begin{array}{r} 17 \\ \underline{20} \\ 0 \end{array}$$

When 0 is a factor, the product is 0.

and how to multiply 2 and 17.

$$\begin{array}{r} {\scriptstyle 1} \\ 17 \\ \underline{20} \\ 340 \end{array}$$

2 tens × 17 = 34 tens or 340.

The wallpaper cost $340.

Working Together

Use the multiplication sentence $6 \times 73 = 438$ to help you complete each of these.

1. 73 × 6 = ▢

2. 73 × 6 tens = ▢ tens

3. 73 × 60 = ▢0

4. 73 × 6 hundreds = ▢ hundreds

5. 73 × 600 = ▢00

6. 73 × 6 thousands = ▢ thousands

7. 73 × 6 000 = ▢ 000

Write 0 in the ones place. Then multiply by 9 (tens).

8. 247 × 90

9. 3406 × 90

Multiply.

10. 486 × 40

11. 329 × 700

12. 80 × 7500

13. 7060 × 3000

Exercises

Multiply.

1. 7134 × 50	**2.** 469 × 700	**3.** 9840 × 6000	**4.** 385 × 200	**5.** 5080 × 800

6. 10×916	**7.** 600×6206	**8.** 3000×368	**9.** 4823×100
10. 327×7000	**11.** 9400×80	**12.** 9000×409	**13.** 3045×4000
14. 200×5000	**15.** 1000×9476	**16.** 2043×400	**17.** 90×8203
18. 5000×5096	**19.** 6009×900	**20.** 70×8796	**21.** 486×8000

Study these multiplication sentences.

$10 \times 5 = 50$	$100 \times 8 = 800$	$1000 \times 4 = 4000$
$10 \times 69 = 690$	$100 \times 71 = 7100$	$1000 \times 65 = 65000$
$10 \times 404 = 4040$	$100 \times 395 = 39500$	$1000 \times 708 = 708000$

Give a rule that helps you find the product when

1. 10 is a factor. **2.** 100 is a factor. **3.** 1000 is a factor.

Multiply. Write only the products.

4. 10×607	**5.** 1000×200	**6.** 974×1000	**7.** 1000×320
8. 100×1305	**9.** 460×10	**10.** 1000×30	**11.** 10×1802
12. 5×1000	**13.** 100×349	**14.** 884×10	
15. 100×560	**16.** 100×462		
17. 7900×10	**18.** 1000×25		

try this

Multiplying by a Two-Digit Number

Angus delivers 34 newspapers in 1 d (day). He delivered newspapers on 26 d in November. How many newspapers did he deliver in November?

Multiply 26 and 34.

For the product

$$\begin{array}{r} 34 \\ \underline{26} \end{array}$$

2 tens 6 ones

you need to know how to multiply 6 and 34,

$$\begin{array}{r} {\scriptstyle 2} \\ 34 \\ \times\ 26 \\ \hline 204 \end{array}$$

and how to multiply 2 and 34.

$$\begin{array}{r} 34 \\ \times\ 26 \\ \hline 204 \\ 680 \end{array}$$

2 tens × 34 = 68 tens or 680.

Then add.

$$\begin{array}{r} 34 \\ \times\ 26 \\ \hline 204 \\ 680 \\ \hline 884 \end{array}$$

Angus delivered 884 newspapers in November.

To estimate the product, round each factor and then multiply.

$$\begin{array}{rcr} 34 & \longrightarrow & 30 \\ \underline{26} & \longrightarrow & \underline{30} \\ & & 900 \end{array}$$

The product is about 900.

Angus delivered about 900 newspapers in November.

Working Together

Multiply by following the steps.

1.

$$\begin{array}{r} 679 \\ \times\ 46 \\ \hline \\ \hline \end{array}$$

Multiply 6 and 679. →
Write 0 in the ones place. →
Multiply 4 (tens) and 679. →
Add.

Estimate each product.

2. 389 × 71

3. 612 × 28

Estimate each product.
Then find the exact product.

4. 825 × 23

5. \$1378 × 59

6. 63 × 7808

7. 98 × \$40 093

Exercises

Estimate each product. Then find the exact product.

1. 23 × 17

2. 61 × 49

3. 74 × 87

4. 98 × 34

5. \$88 × 66

6. 312 × 24

7. 604 × 41

8. 470 × 72

9. 587 × 93

10. \$309 × 57

11. 2516 × 32

12. 3709 × 83

13. 9518 × 54

14. 2005 × 97

15. \$6917 × 61

16. 42 386 × 64

17. 90 807 × 71

18. 34 006 × 89

19. 945 682 × 93

20. \$408 697 × 56

21. 42 × 608

22. 54 × 5240

23. 83 × \$3619

24. 68 × 90 554

25. 43 × 74 563

26. 28 × \$480 865

Use the product in each block as the missing factor in the next.

27.

14 × 18	23 × ▒▒	▒▒ × 19	▒▒ ▒▒

28.

22 × 17	▒▒ × 16	▒▒ × 84	▒▒ ▒▒

Solve.

29. In October, Angus delivered 34 newspapers each day for 27 d. How many newspapers did he deliver in October?

***30.** On 6 d each week, Angus delivered 34 newspapers. How many newspapers did he deliver in 52 weeks?

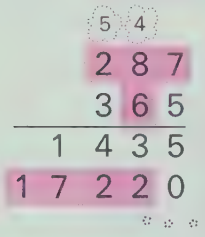
Multiplying by a Three-Digit Number

For the product 287 × 365

3 hundreds 6 tens 5 ones

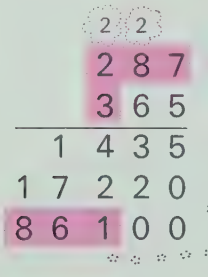
you need to know how to multiply 5 and 287,

how to multiply 6 and 287,



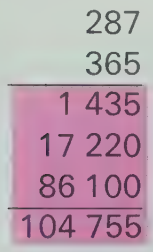
6 tens × 287 = 1722 tens or 17 220.

and how to multiply 3 and 287.



3 hundreds × 287 = 861 hundreds or 86 100.

Then add.



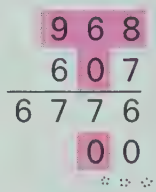
The product of 365 and 287 is 104 755.

For the product 968 × 607

6 hundreds 0 tens 7 ones

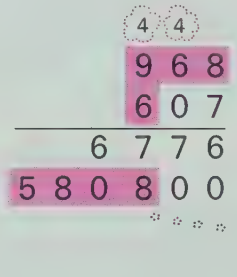
you need to know how to multiply 7 and 968,

how to multiply 0 and 968,



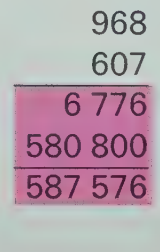
0 tens × 968 = 0 tens or 0.

and how to multiply 6 and 968.



6 hundreds × 968 = 5808 hundreds or 580 800.

Then add.



The product of 607 and 968 is 587 576.

Working Together

Multiply by following the steps.

1.

809
814

Multiply 4 and 809.
Write 0 in the ones place.
Multiply 1 (ten) and 809.
Write 0 in the ones place and in the tens place.
Multiply 8 (hundreds) and 809.
Add.

2.

734
250

Multiply 0 and 734.
Multiply 5 (tens) and 734.
Write 0 in the ones place and in the tens place.
Multiply 2 (hundreds) and 734.
Add.

Multiply.

3. 915
902

4. $208
670

5. 564 × $371

Exercises

Multiply. You can check your multiplication by estimating.

1. 298 457	**2.** 601 421	**3.** 765 605	**4.** 192 580	**5.** $309 803
6. 894 824	**7.** 713 504	**8.** 641 370	**9.** 739 769	**10.** $165 458

11. 625 × 423
12. 170 × 387
13. 806 × 690
14. 245 × $740
15. 621 × $961
16. 389 × $908
17. 476 × 9287
18. 365 × 4071
19. 6234 × 7819

Multiply to find the hidden bingo. A bingo is three products in a row, column, or diagonal.

283 845	282 705	260 664
260 604	261 778	252 456
253 044	252 054	264 024

20. 705 × 401
21. 942 × 268
22. 852 × 297
23. 684 × 386
24. 513 × 508
25. 803 × 326

Practice

First, estimate the product without doing any work on paper. Then multiply and compare the product with your estimate.

1. 732 × 6	**2.** 8054 × 99	**3.** 63 745 × 8	**4.** 403 × 50	**5.** 46 × 94
6. 128 × 58	**7.** 607 × 935	**8.** 861 × 600	**9.** 293 × 903	**10.** 485 × 520

11. 70 × 9217	**12.** 43 × 1834	**13.** 6 × 600 056
14. 400 × 6127	**15.** 907 × 290	**16.** 5200 × 60
17. 4932 × 6410	**18.** 500 × 500	**19.** 729 × 182
20. 18 × 908	**21.** 917 × 658	**22.** 400 × 80
23. 43 × 47 286	**24.** 89 × 741 664	**25.** 624 × 2637
26. 248 × 9172	**27.** 3872 × 5796	**28.** 7 × 7 030 463

Write only the products.

29. 10 × 6018	**30.** 726 × 100	**31.** 1000 × 2840
32. 5569 × 1	**33.** 1000 × 879	**34.** 4330 × 100
35. 0 × 7642	**36.** 6800 × 10	**37.** 1 × 2870
38. 2392 × 100	**39.** 3761 × 0	**40.** 4200 × 1000

You can change the order of the factors to check your multiplication.

429	87
× 87	× 429
3 003	783
34 320	1 740
37 323	34 800
	37 323

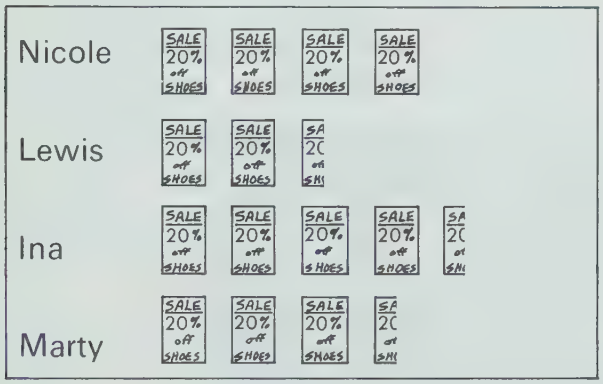
If this result does not match the first result, there is a mistake in your work.

try this

Check your multiplication by changing the order of the factors for Exercises 6, 7, 12, 21 above.

For Exercise 12, which order involved less work?

This pictograph shows how many flyers each student delivered in one week.



Each stands for 16 flyers.

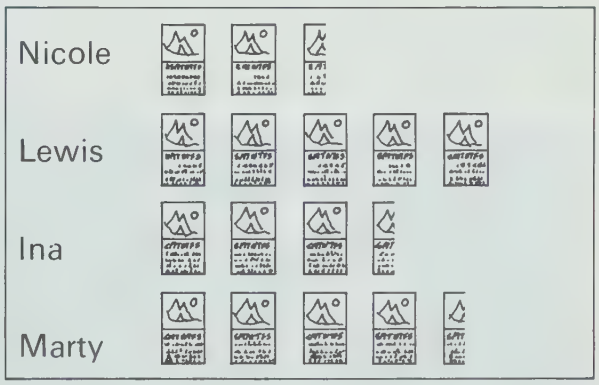
41. How many flyers did Lewis deliver in 1 week?

43. How many flyers did Nicole deliver in all?

45. How many fewer flyers did Nicole deliver than Marty?

47. How many flyers did the four students deliver altogether?

This pictograph shows how many weeks each student delivered flyers.



Each stands for 2 weeks.

42. How many flyers did Marty deliver in 2 weeks?

44. How many more flyers did Ina deliver than Lewis?

46. Which 2 students delivered the same number of flyers?

48. Make up and solve a word problem for multiplication using information in the pictographs.

Using Multiplication to Divide

Kim has 20 crests for 4 hats.
She wants the same number on each.
How many are there for each hat?

Divide 20 by 4.

For $4\overline{)20}$

think $4 \times 5 = 20$.

Write
$$\begin{array}{r} 5 \\ 4\overline{)20} \\ \underline{20} \\ 0 \end{array}$$

5 — crests for each hat

20 — crests used

0 — crests remaining

There are 5 crests for each hat.

Mark has 23 crests for 3 hats.
He wants the same number on each.
How many are there for each hat?

Divide 23 by 3.

For $3\overline{)23}$

think $3 \times 7 = 21$
$3 \times 8 = 24$ . . . too great!

Write
$$\begin{array}{r} 7 \\ 3\overline{)23} \\ \underline{21} \\ 2 \end{array}$$

7 — crests for each hat

21 — crests used

2 — crests remaining

There are 7 crests for each hat and 2 crests left over.

To check Mark's division,

think 3 groups of 7 crests or 3×7, and 2 left over.

quotient → 7 R2 ← remainder

divisor → $3\overline{)23}$ ← dividend

$\underline{21}$

2 ← remainder

Write $3 \times 7 = 21$

$21 + 2 = 23$

To check a division, multiply the divisor and the quotient. Then add the remainder.

If the result does not match the dividend, there is a mistake in your work.

Working Together

Give the multiplication fact that you would use to find the quotient.

Example: For $6\overline{)52}$, think

$6 \times 8 = 48$

$6 \times 9 = 54$ . . . too great!

Use $6 \times 8 = 48$.

1. $4\overline{)31}$ **2.** $8\overline{)75}$ **3.** $49 \div 7$

Divide. Show the quotient and the remainder. Then check.

4. $4\overline{)25}$ **5.** $10 \div 7$

6. $2\overline{)19}$ **7.** $42 \div 6$

8. $9\overline{)83}$ **9.** $4 \div 1$

Exercises

Divide. Write the remainder beside the quotient when the remainder is not 0. Check the ones that you found difficult.

1. $6\overline{)36}$ **2.** $2\overline{)17}$ **3.** $5\overline{)49}$ **4.** $7\overline{)9}$ **5.** $3\overline{)29}$

6. $9\overline{)72}$ **7.** $8\overline{)47}$ **8.** $4\overline{)38}$ **9.** $1\overline{)9}$ **10.** $1\overline{)1}$

11. $13 \div 2$ **12.** $61 \div 7$ **13.** $3 \div 2$ **14.** $40 \div 5$

15. $7 \div 4$ **16.** $64 \div 8$ **17.** $25 \div 6$ **18.** $85 \div 9$

Solve.

19. Max has 15 badges to give to 8 friends. If each receives the same number, how many does each receive? How many are left over?

20. Sue had 36 crests. She sewed the same number on each of 7 jackets. How many are on each? How many are left over?

Dividing by a One-Digit Number

Each team is made of 9 cards.
Michael has 306 cards.
How many teams does he have?

Divide 306 by 9. $9\overline{)306}$

306 shows 3 hundreds. Since 3 is less than 9, think of 3 hundreds 0 tens as 30 tens. Then divide the 30 tens.

$9 \times 3 = 27$
$9 \times 4 = 36$ . . . too great!

Use 9×3 tens = 27 tens.

Write
$$\begin{array}{r} 3 \\ 9\overline{)306} \\ 27 \\ \hline 3 \end{array}$$

Think of the 3 tens 6 ones that remain as 36 ones.

$$\begin{array}{r} 3 \\ 9\overline{)306} \\ 27\downarrow \\ \hline 36 \end{array}$$

Then divide the 36 ones.

$9 \times 4 = 36$

Write
$$\begin{array}{r} 34 \\ 9\overline{)306} \\ 27 \\ \hline 36 \\ 36 \\ \hline 0 \end{array}$$

Michael has 34 pictures.

Working Together

Complete.

1. $6\overline{)4376}$

72 R
42
17
12
56

2. $5\overline{)1948}$

38 R
15
44
40

3. $8\overline{)93\,921}$

1 R
8
1

To check the division, multiply the divisor and the quotient. Then add the remainder.

Divide. Then check your work.

4. $3\overline{)78}$ **5.** $2\overline{)400}$ **6.** $2\overline{)1381}$ **7.** $\$61\,024 \div 8$

Exercises

Divide. Check your work for five difficult exercises.

1. $2\overline{)37}$ **2.** $5\overline{)89}$

3. $6\overline{)549}$ **4.** $1\overline{)4672}$

5. $3\overline{)803}$ **6.** $8\overline{)5600}$

7. $9\overline{)3242}$ **8.** $7\overline{)7000}$

9. $5\overline{)6752}$ **10.** $4\overline{)9320}$

11. $7\overline{)\$434}$ **12.** $9\overline{)\$12\,078}$

13. $1361 \div 2$ **14.** $4908 \div 5$

15. $24\,788 \div 3$ **16.** $37\,272 \div 4$

17. $88\,475 \div 7$ **18.** $89\,765 \div 6$

19. $1597 \div 5$ **20.** $6920 \div 7$

21. $12\,740 \div 4$ **22.** $9453 \div 2$

23. $\$3492 \div 9$ **24.** $\$5460 \div 7$

Each group of numbers forms a division. Write the division.

Example: For 4, 26, 6, 2, write $4\overline{)26}$ 6 R2

25. 7, 6264, 6, 894

26. 3, 4, 1269, 5079

27. 1788, 5, 4, 8944

Solve.

28. Adele has 240 cards. Each picture is made of 8 cards. How many pictures does she have?

29. There are 132 cards. As many as possible are dealt to 7 players. How many does each get? How many are left over?

Zeros in the Quotient

Sometimes zeros are needed in the quotient as place holders.

Divide 3042 by 6.

Divide 30 hundreds.	Show the tens that remain.	Divide 4 tens.	Show the ones that remain.	Divide 42 ones.
5	5	50	50	507
6)3042	6)3042	6)3042	6)3042	6)3042
30	30↓	30	30 ↓	30
0	04	04	042	042
				42
				0

$3042 \div 6 = 507$.

The zero is needed in the quotient to show 3042 divided by 6 is 507. 3042 divided by 6 is not 57.

Working Together

Give the next digit for each quotient.

1.	2.	3.
6	7 0	10
3)1803	8)56 621	7)70 680
18	56	7
00	0 62	00 6

Divide.

4. $5\overline{)20\,150}$ **5.** $8\overline{)8483}$ **6.** $41\,209 \div 2$ **7.** $18\,075 \div 9$

Exercises

Divide.

1. $2\overline{)10\,064}$ **2.** $7\overline{)42\,718}$ **3.** $9\overline{)72\,557}$ **4.** $4\overline{)93\,623}$

5. $8\overline{)40\,487}$ **6.** $5\overline{)102\,019}$ **7.** $3\overline{)211\,505}$ **8.** $8\overline{)72\,247}$

9. $81\,010 \div 9$ **10.** $35\,440 \div 7$ **11.** $40\,009 \div 4$ **12.** $35\,045 \div 5$

13. $60\,015 \div 3$ **14.** $61\,830 \div 6$ **15.** $80\,600 \div 2$ **16.** $72\,727 \div 8$

Finding the Average

4 pieces of wood were used for 1 kite, 8 were used for another, and 2 for each of 2 other kites. What was the **average** number of pieces of wood for each kite?

Add 4, 8, 2, and 2.

the numbers in each group

Then divide the sum by 4.

the number of groups

$4 + 8 + 2 + 2 = 16$

$16 \div 4 = 4$

The average number of pieces of wood for each kite was 4.

Working Together

What number would you divide by to find the average?

1. 3, 9 **2.** 7, 4, 6, 0, 8

Find the average.

3. 365 in 5 groups

4. 1674 in 9 groups

5. 7, 7, 7, 7

6. 796, 796, 1421, 0, 15, 8

7. \$72, \$64, \$137

Exercises

Copy and complete.

1.

Number in all	2568	5616	7063	?
Number of groups	6	8	7	3
Average	?	?	?	905

Find the average.

2. 280 in 8 groups

3. 6264 in 4 groups

4. 6, 5, 0, 9, 5

5. 4, 4, 4, 4, 4, 4, 4, 4, 4

6. \$72, \$86, \$137, \$582, \$638

7. 759 km, 973 km

8. 1728 kg, 4936 kg, 3725 kg

9. 7 mm, 8 mm, 9 mm, 1 mm, 5 mm

Solve.

10. 432 m of string were used for 8 kites. What was the average length of string for each kite?

11. 24 m^2 (square metres) of material were used for 8 kites. What was the average amount of material for each?

Dividing by Multiples of 10

80 students rode 1920 km altogether in a bike-athon. What was the average distance each student rode?

Divide 1920 by 80.

1920 shows 1 thousand.

1920 shows 19 hundreds.

Since
19 is less than 80, think of
19 hundreds 2 tens as 192 tens.
Then divide the 192 tens.

$80 \times 2 = 160$

$80 \times 3 = 240$ . . . too great!

Use 80×2 tens $= 160$ tens.

Write

$$\begin{array}{r} 2 \\ 80\overline{)1920} \\ 160 \\ \hline 32 \end{array}$$

Think of the 32 tens 0 ones that remain as 320 ones.

$$\begin{array}{r} 2 \\ 80\overline{)1920} \\ 160\downarrow \\ \hline 320 \end{array}$$

Then divide the 320 ones.

$80 \times 4 = 320$

Write

$$\begin{array}{r} 24 \\ 80\overline{)1920} \\ 160 \\ \hline 320 \\ 320 \\ \hline 0 \end{array}$$

The average distance each student rode was 24 km.

Working Together

Round to the nearest ten.

1. 36 **2.** 47 **3.** 32 **4.** 75

Complete.

5.
```
      4 38
10)43 860
   40
    3 8
    3 0
      86
      80
       60
```

6.
```
      81  R
40)32 597
   32 0
      59
      40
```

7.
```
       9  R
80)73 924
   72 0
```

Divide.

8. $20\overline{)3760}$ **9.** $50\overline{)52\,360}$ **10.** $27\,005 \div 60$

Exercises

Divide. Check the difficult ones.

1. $30\overline{)2910}$ **2.** $40\overline{)3880}$

3. $10\overline{)8740}$ **4.** $70\overline{)7000}$

5. $80\overline{)95\,472}$ **6.** $60\overline{)85\,963}$

7. $90\overline{)92\,006}$ **8.** $50\overline{)57\,650}$

9. $10\overline{)6730}$ **10.** $40\overline{)7904}$

11. $36\,500 \div 50$ **12.** $56\,002 \div 80$

13. $4356 \div 60$ **14.** $76\,521 \div 10$

15. $55\,000 \div 90$ **16.** $97\,362 \div 70$

Complete each in three different ways.

17. $40\overline{)\quad}$ R

18. $70\overline{)\quad}$ R25

Work inside the parentheses first. Then work from left to right.

1. $(23 \times 714) \div 7$

2. $23 \times (714 \div 7)$

3. $48\,400 \div (8 \times 10)$

4. $(48\,400 \div 8) \times 10$

5. $(14\,760 \div 60) \div 6$

6. $14\,760 \div (60 \div 6)$

7. $68 \times (73 \times 84)$

8. $(68 \times 73) \times 84$

9. $794 \times (31\,900 \div 50)$

10. $36\,360 \div (20 \times 2)$

try this

Dividing by a Two-Digit Number

Divide 4489 by 62.

For $62\overline{)4489}$, think of $60\overline{)4489}$.

62 rounded to the nearest ten is 60.

4489 shows 4 thousands 4 hundreds or 44 hundreds.
Since 44 is less than 60, think of
44 hundreds 8 tens as 448 tens.
Then divide the 448 tens.

$60 \times 7 = 420$

$60 \times 8 = 480$ . . . too great!

Use 62×7 tens = 434 tens.

Write

$$\begin{array}{r} 7 \\ 62\overline{)4489} \\ 434 \\ \hline 14 \end{array}$$

$$\begin{array}{r} 7 \\ 62\overline{)4489} \\ 434\downarrow \\ \hline 149 \end{array}$$

Think of the 14 tens 9 ones
that remain as 149 ones.

Then divide the 149 ones.

$60 \times 2 = 120$

$60 \times 3 = 180$ . . . too great!

Use $62 \times 2 = 124$.

Write

$$\begin{array}{r} 72 \text{ R25} \\ 62\overline{)4489} \\ 434 \\ \hline 149 \\ 124 \\ \hline 25 \end{array}$$

$4489 \div 62 = 72$ R25

Working Together

Complete.

1.
$$\begin{array}{r} 3\,16\blacksquare\ R\blacksquare \\ 31\overline{)98\,075} \\ \underline{93} \\ 5\,0 \\ \underline{3\,1} \\ 1\,97 \\ \underline{1\,86} \\ \blacksquare\blacksquare \\ \underline{\blacksquare\ \ } \\ \blacksquare \end{array}$$

2.
$$\begin{array}{r} 1\,2\blacksquare\,\blacksquare R\blacksquare \\ 75\overline{)92\,095} \\ \underline{75} \\ 17\,0 \\ \underline{\blacksquare\blacksquare} \\ \blacksquare\blacksquare \\ \underline{\blacksquare\blacksquare} \\ \blacksquare\blacksquare \\ \underline{\blacksquare\blacksquare} \\ \blacksquare \end{array}$$

Divide.

3. $13\overline{)143}$

4. $89\overline{)28\,876}$

5. $8917 \div 22$

6. $30\,220 \div 56$

Exercises

Divide. Check your work for five difficult exercises.

1. $23\overline{)69}$	**2.** $78\overline{)93}$	**3.** $61\overline{)85}$	**4.** $18\overline{)60}$
5. $11\overline{)583}$	**6.** $42\overline{)438}$	**7.** $29\overline{)700}$	**8.** $68\overline{)372}$
9. $53\overline{)4289}$	**10.** $87\overline{)6498}$	**11.** $67\overline{)4245}$	**12.** $33\overline{)1462}$
13. $34\overline{)23\,970}$	**14.** $51\overline{)25\,908}$	**15.** $48\overline{)79\,662}$	**16.** $78\overline{)98\,092}$

17. $54\,064 \div 19$ **18.** $38\,186 \div 72$ **19.** $63\,320 \div 89$

20. $268\,630 \div 44$ **21.** $129\,300 \div 27$ **22.** $642\,137 \div 79$

Solve.

23. When 21 scouts cleaned a conservation area, they found 525 cans. What was the average number of cans for each scout?

24. 24 scouts collected 264 kg of garbage. What was the average amount of garbage that each scout collected?

25. 31 scouts gathered 124 bags of garbage. What was the average number of bags of garbage gathered by each scout?

Dividing by a Two-Digit Number

Divide 2528 by 32.

For $32\overline{)2528}$,
think of $30\overline{)2528}$.

For $30\overline{)2528}$, think of
2528 as 252 tens 8 ones.
Then divide the 252 tens.

$30 \times 8 = 240$

$30 \times 9 = 270$ . . . too great!

Try using 32×8 tens.

32×8 tens = 256 tens

$$\begin{array}{r} 8 \\ 32\overline{)2528} \\ 256 \\ \hline \end{array}$$

∴ Cannot subtract 256 from 252.

Use 32×7 tens.

32×7 tens = 224 tens

$$\begin{array}{r} 7 \\ 32\overline{)2528} \\ 224 \\ \hline 28 \end{array}$$

Then complete the division.

$$\begin{array}{r} 79 \\ 32\overline{)2528} \\ 224 \\ \hline 288 \\ 288 \\ \hline 0 \end{array}$$

$2528 \div 32 = 79$

Divide 5504 by 67.

For $67\overline{)5504}$,
think of $70\overline{)5504}$.

For $70\overline{)5504}$, think of
5504 as 550 tens 4 ones.
Then divide the 550 tens.

$70 \times 7 = 490$

$70 \times 8 = 560$ . . . too great!

Try using 67×7 tens.

67×7 tens = 469 tens

$$\begin{array}{r} 7 \\ 67\overline{)5504} \\ 469 \\ \hline 81 \end{array}$$

∴ greater than the divisor

Use 67×8 tens.

67×8 tens = 536

$$\begin{array}{r} 8 \\ 67\overline{)5504} \\ 536 \\ \hline 14 \end{array}$$

Then complete the division.

$$\begin{array}{r} 82 \text{ R10} \\ 67\overline{)5504} \\ 536 \\ \hline 144 \\ 134 \\ \hline 10 \end{array}$$

$5504 \div 67 = 82$ R10

Rounding the divisor and the dividend can help you estimate the quotient.

For $67\overline{)5504}$, round

$$67\overline{)5504}$$

$$70\overline{)5500}$$

For $70\overline{)5500}$, think

7 or 8? . . . 8 is closer!

$7\overline{)55}$

Use 8 in the quotient.

$7 \times 8 = 56$

the rounded divisor

$70 \times 8 = 560$

$70 \times 80 = 5600$

5600 is close to 5500.

80 is an estimate for $5504 \div 67$.

Working Together

Complete.

1. $72\overline{)2447}$

$$\begin{array}{r} 3\square\ \text{R}\square \\ 72\overline{)2447} \\ \underline{216} \\ 287 \\ \underline{\square\square} \\ \square \end{array}$$

2. $57\overline{)2570}$

$$\begin{array}{r} 4\square\ \text{R}\square \\ 57\overline{)2570} \\ \underline{228} \\ \square\square \\ \underline{\square\square} \\ \square \end{array}$$

Give the rounded divisor.
Then give the rounded dividend.

3. $44\overline{)9720}$

4. $23\overline{)43\,170}$

Estimate each quotient.
Then divide to find the quotient.

5. $84\overline{)5620}$

6. $94\overline{)\$75\,012}$

Exercises

Estimate each quotient.
Then divide to find the quotient.

1. $63\overline{)542}$
2. $38\overline{)278}$
3. $76\overline{)2300}$
4. $51\overline{)3632}$
5. $28\overline{)9356}$
6. $12\overline{)4789}$
7. $89\overline{)38\,270}$
8. $42\overline{)25\,153}$
9. $47\overline{)19\,923}$
10. $33\overline{)25\,986}$
11. $94\overline{)63\,700}$
12. $72\overline{)31\,639}$
13. $84\,010 \div 23$
14. $79\,102 \div 92$
15. $\$24\,087 \div 37$
16. $478\,057 \div 68$
17. $39\,285 \div 46$
18. $\$346\,995 \div 55$

Dividing by a Three-Digit Number

On "Trees for Canada" Day, 205 scouts planted 12 710 trees. What was the average number of trees planted by each scout?

For $205\overline{)12\,710}$, think of $200\overline{)12\,710}$.

For $200\overline{)12\,710}$, think of 12 710 as 1271 tens 0 ones. Then divide the 1271 tens.

$200 \times 6 = 1200$

$200 \times 7 = 1400$ . . . too great!

Use 205×6 tens.

$$\begin{array}{r} 6 \\ 205\overline{)12\,710} \\ 12\,30 \\ \hline 41 \end{array}$$

Think of the 41 tens that remain as 410 ones.

$$\begin{array}{r} 6 \\ 205\overline{)12\,710} \\ 12\,30\downarrow \\ \hline 410 \end{array}$$

Then divide the 410 ones.

$$\begin{array}{r} 62 \\ 205\overline{)12\,710} \\ 12\,30 \\ \hline 410 \\ 410 \\ \hline 0 \end{array}$$

The average number of trees planted by each scout was 62.

Working Together

Complete.

1. $395\overline{)24\,687}$

$$\begin{array}{r} 6\,\square\,\text{R}\,\square \\ 395\overline{)24\,687} \\ \underline{23\,70} \\ \square \\ \underline{\square} \\ \square \end{array}$$

2. $823\overline{)73\,684}$

$$\begin{array}{r} 8\,\square\,\text{R}\,\square \\ 823\overline{)73\,684} \\ \underline{\square} \\ \square \\ \underline{\square} \\ \square \end{array}$$

Divide.

3. $200\overline{)19\,886}$
4. $104\overline{)10\,812}$
5. $34\,270 \div 745$
6. $82\,893 \div 634$

Exercises

Complete three exercises in each box. Write the result for the fourth one by using the pattern.

1. $122\overline{)860}$	**2.** $452\overline{)6340}$	**3.** $642\overline{)13\,500}$	**4.** $897\overline{)25\,140}$
5. $300\overline{)19\,225}$	**6.** $610\overline{)45\,170}$	**7.** $493\overline{)41\,447}$	**8.** $212\overline{)19\,968}$
9. $102\overline{)10\,710}$	**10.** $499\overline{)53\,493}$	**11.** $385\overline{)42\,165}$	**12.** $648\overline{)72\,228}$
13. $251\overline{)12\,560}$	**14.** $782\overline{)78\,300}$	**15.** $523\overline{)78\,460}$	**16.** $453\overline{)90\,700}$

17. Make up a fifth exercise to fit each of the patterns above.

18. Each of 345 scouts planned to plant the same number of trees. They planned to plant 17 250 trees in all. How many did each scout plan to plant?

19. Four scout troops have 31 members each. They planted 8308 trees in all. What was the average number of trees planted by each scout?

Practice

First, estimate the quotient without doing any work on paper. Then divide and compare the quotient with your estimate.

1. $10\overline{)4382}$	**2.** $63\overline{)5150}$	**3.** $39\overline{)9506}$	**4.** $21\overline{)\$840}$
5. $640\overline{)78\,932}$	**6.** $40\overline{)956}$	**7.** $457\overline{)531}$	**8.** $100\overline{)\$52\,300}$
9. $300\overline{)47\,286}$	**10.** $76\overline{)76\,152}$	**11.** $90\overline{)3600}$	**12.** $510\overline{)\$40\,800}$
13. $671\overline{)107\,360}$	**14.** $71\overline{)71\,071}$	**15.** $84\overline{)480\,040}$	**16.** $70\overline{)\$28\,420}$

17. $13\,635 \div 65$ **18.** $82\,606 \div 59$ **19.** $\$7000 \div 14$

20. $106\,827 \div 98$ **21.** $728\,009 \div 208$ **22.** $\$46\,556 \div 452$

Five students are playing a game. Each player rolls a die. The number on the die shows how many blocks a player can move. Then the player gives the quotient for the exercise in the block reached. If the quotient is correct, the player places a marker in that block.

Locate each player's marker.

	Player	Last correct quotient
23.	Alison	46
24.	Bert	20
25.	Carol	2001
26.	Dennis	210
27.	Earl	104

Start	$24\overline{)1128}$	$62\overline{)868}$
$92\overline{)12\,880}$	$15\overline{)30\,015}$	$40\overline{)34\,800}$
$35\overline{)15\,750}$	$26\overline{)2314}$	$24\overline{)1104}$
$22\overline{)46\,200}$	$340\overline{)680}$	$19\overline{)38\,190}$
$73\overline{)15\,330}$	$54\overline{)5562}$	$95\overline{)11\,495}$
$70\overline{)7840}$	$24\overline{)1056}$	$92\overline{)6164}$
$64\overline{)25\,920}$	$34\overline{)680}$	$304\overline{)3648}$
Finish	$84\overline{)10\,920}$	$58\overline{)6032}$

Solve.

The symbol ha stands for **hectare**.

1 ha = 10 000 m²

28. From 19 ha of land, Bruce's family had 62 415 kg of straw. What was the average amount of straw from each hectare?

29. They grew 98 604 kg of hay on 18 ha. What was the average amount of hay on each hectare?

***30.** If each of their 4 horses eats 6 kg of hay in one day, in how many weeks would they eat 8736 kg of hay?

***31.** If each of their 43 cattle is fed 2 kg of hay each day, how long would 62 608 kg of hay last?

Copy and complete the patterns.

1. 4, 8, 12, ▭, ▭, ▭, ▭, 32

2. 0, 5, 10, ▭, ▭, ▭, ▭, ▭

3. 200, 400, 600, ▭, ▭, ▭

4. 81, 72, ▭, ▭, ▭, ▭, 27

5. 132, 144, ▭, ▭, ▭, ▭, 204

6. 99, 88, ▭, ▭, ▭, 44, ▭, ▭

7. 52, 65, 78, ▭, ▭, ▭, ▭, 143

8. 910, 920, ▭, ▭, ▭, 960, ▭

9. 168, 152, 136, 120, ▭, ▭, ▭

10. 119, ▭, ▭, ▭, ▭, 34, 17, 0

11. 26, 32, 30, 36, 34, ▭, ▭, ▭, 42

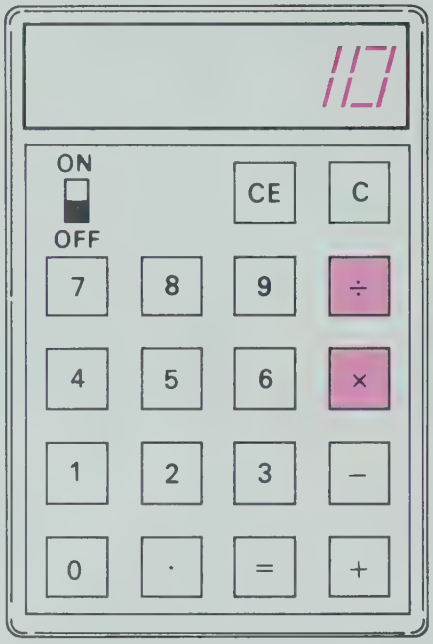
12. 15, 21, 26, 30, ▭, ▭, 36

13. Write three other patterns of numbers.

try this

Keycharts and the × and ÷ Keys

To use a calculator you need to know
the order in which keys should be pressed.



Each of the 10 teams in the softball league plays each of the other 9 teams twice. Then there are 2 play-off games and 1 final game. How many games are there altogether?

Multiply, then multiply again,
then add, then add again.
. . . ×, then ×, then +, then +.

To show which keys to use to solve this problem, Jean made a **keychart**.

10
×
9
×
2
+
2
+
1
=
———

10 × 9 × 2 + 2 + 1 = ———

Keycharts may be written up or down.

Keycharts can be different for different calculators. For the calculator you use, are these keycharts correct for finding the result?

Make a keychart that shows how to solve each of these.

1. Each of the 10 teams in the softball league has 16 players this year. There were 148 players altogether last year. How many more players are there this year than last?

2. Last year the average number of fans for each game was 55. This year the total number of fans for the 183 games was 11 346. How much greater was the average number of fans for each game this year than last?

3. The league sold 30 ice cream bars at each of 180 games, 45 at the 2 play-off games, and 75 at the final game. How many were sold in all?

4. 2928 runs were scored in the 183 games this year and 2769 runs last year. What was the average number of runs per game this year?

5. There were 531 home runs this year. Last year there were 594 home runs. How many more home runs were there last year than this?

6. In 18 games, a team played for 27 h 54 min. What was the average number of minutes for each game?

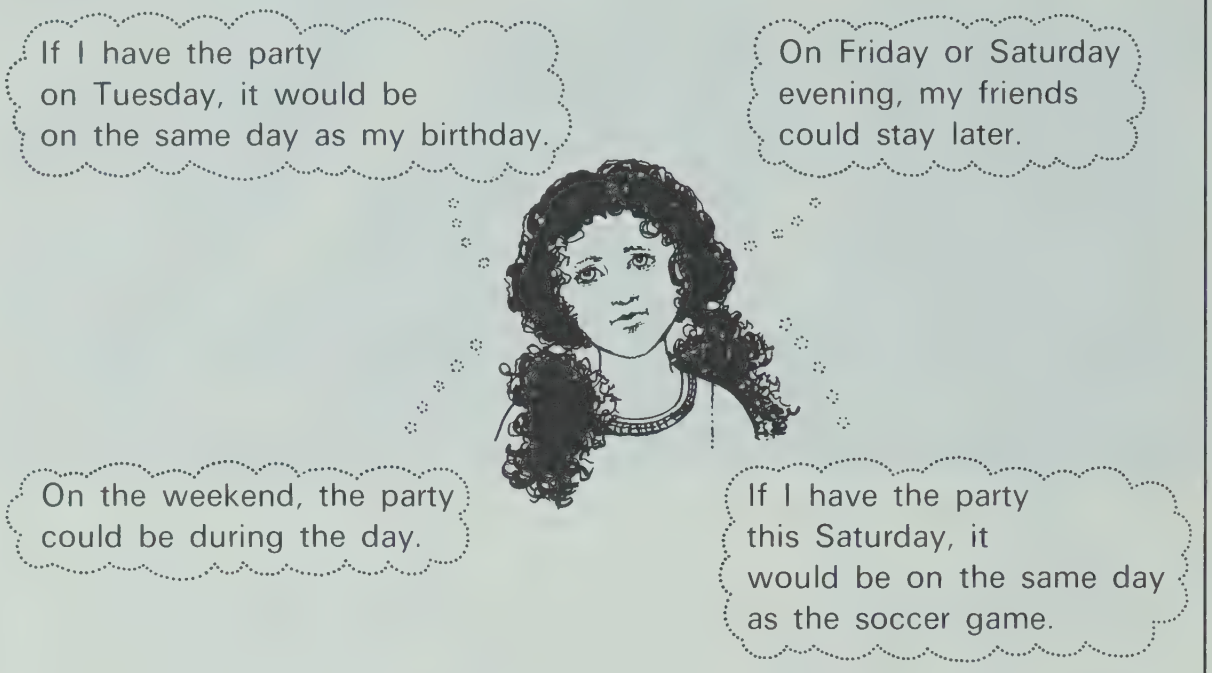
7. The team that won the final game played for 31 h 20 min in 20 games. What was the average number of minutes for each game?

Calculator

Situations That Affect Answers

An answer sometimes depends upon the situation.

Melanie is deciding when to have her party.


If I have the party on Tuesday, it would be on the same day as my birthday.
On Friday or Saturday evening, my friends could stay later.
On the weekend, the party could be during the day.
If I have the party this Saturday, it would be on the same day as the soccer game.

What other situations could affect Melanie's decision?

Different answers are possible for each of these.
Tell how different situations would affect the answers.

1. At what time will you have the party?
2. Which cake recipe will you use?
3. How high should we make the fence?
4. How many gates should we build?
5. How will we get to the third floor of the building?
6. How many steps would you take in crossing the room?
7. How many stamps will you put on the letter?
8. How many letters will you write to your friends this month?
9. Which colored pencils will you use for the map?
10. How many cans of paint should we buy for this room?
11. Which record will you buy?

PROBLEM SOLVING

Checking Up

Multiply.

1. 29 × 4

2. 602 × 8

3. 856 × 50

4. 5007 × 81

5. $69 × 96

6. 317 × 74

7. 7061 × 29

8. 395 × 205

9. 815 × 840

10. $276 × 563

11. 10 × 2895

12. 6 × 7403

13. 400 × $736

14. 598 × 937

15. 361 × 100

16. 408 × $504

Divide.

17. $8\overline{)63}$

18. $7\overline{)4200}$

19. $20\overline{)5683}$

20. $49\overline{)\$74\,480}$

21. $17\overline{)39\,866}$

22. $34\overline{)61\,524}$

23. $423\overline{)17\,018}$

24. $659\overline{)\$40\,858}$

25. 94 962 ÷ 73

26. 2894 ÷ 30

27. $79 870 ÷ 98

28. 65 000 ÷ 500

29. 58 292 ÷ 67

30. $18 848 ÷ 248

Find the average.

31. 86, 264, 745, 620, 598, 412, 861, 570, 45, 9

32. $440, $72, $1561, $838, $500, $60, $9, $732, $258, $192, $13

Solve.

33. Carmen helped her parents plant tomatoes on their farm. They planted 175 rows with 115 plants in each. How many tomato plants were there?

34. Last summer Sam spent 84 h painting a fence with 336 boards. How many minutes did he spend on each board, if it took him the same amount of time for each?

35. During a year, 235 students collected 28 670 kg of paper for recycling. What was the average mass of paper collected by each student?

36. Rosemary plans to knit a scarf that has 36 stitches in each row and 375 rows. How many stitches will there be in her scarf?

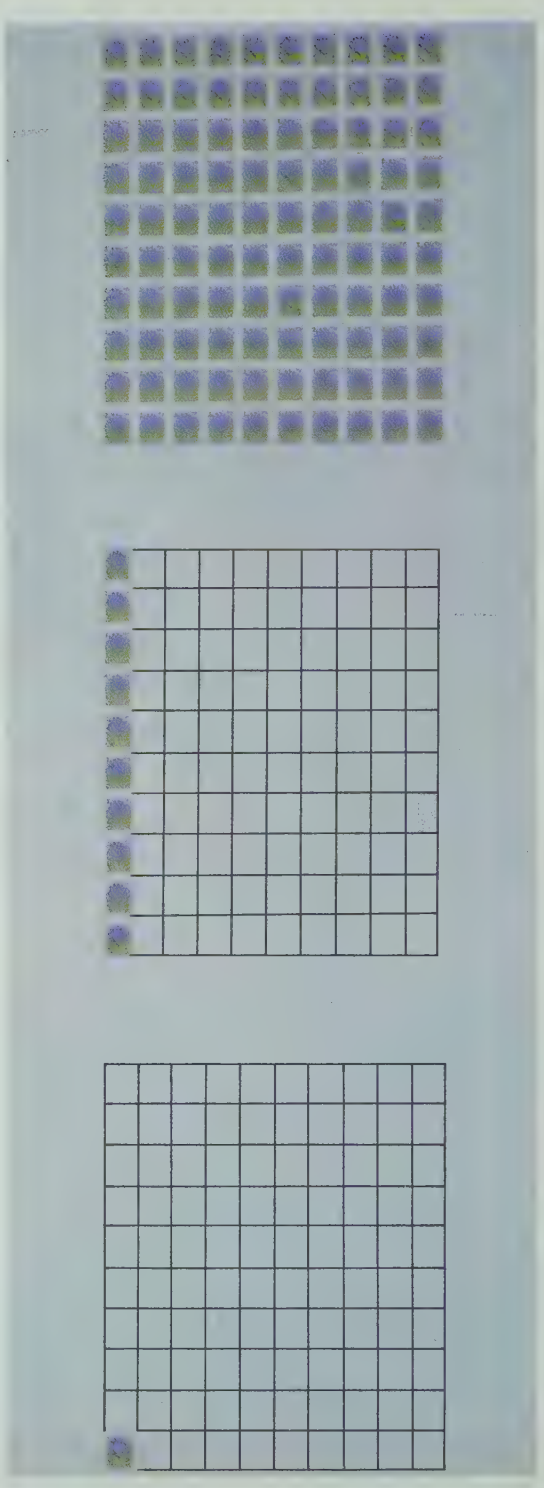
5 DECIMALS

Tenths and Hundredths

100 one-cent stamps are 1 sheet of stamps.

The value of 100 one-cent stamps is $1.00.

ones	tenths	hundredths
1	0	0



10 one-cent stamps are one-tenth
or 0.1 of a sheet of stamps.

A decimal with one digit to the right of the decimal point is a **one-place decimal**.

The value of 10 one-cent stamps is $0.10.

ones	tenths	hundredths
0	1	0

1 one-cent stamp is one-hundredth
or 0.01 of a sheet of stamps.

A decimal with two digits to the right of the decimal point is a **two-place decimal**.

The value of 1 one-cent stamp is $0.01.

ones	tenths	hundredths
0	0	1

243 one-cent stamps are
two and forty-three hundredths
or 2.43 sheets of stamps.
The value of 243 one-cent stamps is $2.43.

ones	tenths	hundredths
2	4	3

Remember that the word "and" is used for the decimal point.

Working Together

Write the decimals.

1.

ones	tenths	hundredths
5	0	6

2.

3. nine-tenths

Write the words.

4.

tens	ones	tenths
4	2	3

5.

6. 17.1

Exercises

For each of these, write the decimal and the word name.

1.

tens	ones	tenths
5	0	2

2.

ones	tenths	hundredths
6	3	9

3.

4.

Copy and complete the chart.

	ones	tenths	hundredths	Words	Decimals
5.	0	8	8	?	?
6.	?	?	?	seven and four-tenths	?
7.	?	?	?	?	3.15
8.	?	?	?	nine and six-hundredths	?

In expanded form, $12.75 = 10 + 2 + 0.7 + 0.05$

Write each in expanded form.

1. 3.5 **2.** 6.37 **3.** 0.02 **4.** 0.85 **5.** 100.25

Write each in standard form.

6. $1 + 0.6 + 0.06$ **7.** $7 + 0.9$

8. $30 + 5 + 0.08$ **9.** $0.2 + 0.04$

try this

Thousandths and Ten-Thousandths

This stamp is 0.0889 mm thick.

0.0889 means 889 of 10 000 equal parts.

0.0889 is a **four-place decimal.** It has four digits to the right of the decimal point.

A decimal with three digits to the right of the decimal point is a **three-place decimal.**

ones	tenths	hundredths	thousandths	ten-thousandths
0	0	8	8	9

To read any decimal, use the place name of its last digit.

0.08 is "8 *hundredths*".

0.088 is "88 *thousandths*".

0.0889 is "889 *ten-thousandths*".

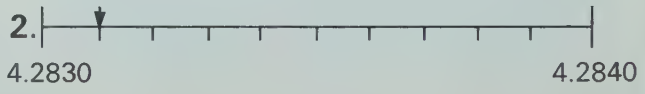
Working Together

Write the decimals.

1.

ones	tenths	hundredths	thousandths
1	2	0	3

2.



Write the decimals.

3. thirty-eight thousandths

4. four ten-thousandths

Write the words.

5. 6.7192

6. 0.301

Exercises

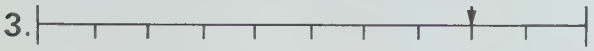
Write the decimals.

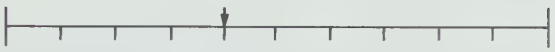
1.

ones	tenths	hundredths	thousandths
2	7	9	8

2.

ones	tenths	hundredths	thousandths	ten-thousandths
3	3	6	0	5

3. 

4. 

5. eight hundred ninety-two thousandths

6. two thousand four hundred eighty-three ten-thousandths

7. six-thousandths

8. five hundred five-thousandths

9. one hundred thirty-seven ten-thousandths

10. one hundred and thirty-seven ten-thousandths

Write the words.

11. 4.235 **12.** 1.5425 **13.** 0.248 **14.** 0.1666 **15.** 16.809

16. 5.4807 **17.** 0.0001 **18.** 1.003 **19.** 3.1008 **20.** 2.4036

What does each 4 mean?

21. 5.284 **22.** 0.1824 **23.** 17.4289 **24.** 3.347 **25.** 4.2051

Study this place-value chart.

?	?	?	?	?	tens	ones	tenths	?	?	?	?	?
2	7	7	9	1	3	4	1	8	3	2	7	8

1. Copy and complete the place-value chart.

2. What patterns can you find in the place-value names?

3. Write the decimal.

4. Write the word.

For each of these, draw a place-value chart.
Then write the word name.

5. 3 600 890.503 684

6. 9 304 700.040 095

try this

Comparing Decimals

At 15°C, the sound of fireworks travels 341.109 m in 1 s. At 16°C, it travels 341.700 m in 1 s. At which temperature does the sound of fireworks travel faster?

Compare the digits from the left.

341 .109 } show the same
341 .700 } whole number.

341. 1 09 shows 1 tenth.
341. 7 00 shows 7 tenths.

341.700 > 341.109

The sound of fireworks travels faster at 16°C than at 15°C.

Working Together

Write each as a four-place decimal.

1. 4.237 **2.** 1.6

Write each as a three-place decimal.

3. 0.56 **4.** 7

Write each as a two-place decimal.

5. 3.1400 **6.** 2

For each of these, show the same number of digits to the right of the decimal point. Then tell which is greater.

7. 4.3
4.13

8. 19
19.1436

Use >, <, or = to make true statements.

9. 3.313 ◯ 3.13

10. 5 ◯ 5.00

Exercises

Write each as a four-place decimal.

1. 7.285 **2.** 4.26 **3.** 1.4 **4.** 0.2 **5.** 9

Write each as a three-place decimal.

6. 6.93 **7.** 8.7 **8.** 2 **9.** 0.2430 **10.** 15

Write each as a two-place decimal.

11. 1.2 **12.** 5.4000 **13.** 6 **14.** 0.3 **15.** 432

Write each as a one-place decimal.

16. 3 **17.** 10.00 **18.** 628 **19.** 8.100 **20.** 1072

Use $>$, $<$, or $=$ to make true statements.

21. 8.3246 ◯ 8.2346
22. 5.001 ◯ 5.011
23. 7.1 ◯ 7.100
24. 3.733 ◯ 37.33
25. 14 ◯ 14.0
26. 9.758 ◯ 9.570
27. 6.4320 ◯ 6.432
28. 0.25 ◯ 0.225
29. 3.000 ◯ 3.0
30. 7.36 ◯ 7
31. 12.666 ◯ 126.66
32. 6.0011 ◯ 6.0001

Solve.

33. At 28°C, the sound of fireworks travels 348.715 m in 1 s. At 27°C, it travels 348.132 m in 1 s. At which temperature does it travel faster?

34. At 17°C, the sound of fireworks travels 342.291 m in 1 s. At 18°C, it travels 342.881 m in 1 s. At which temperature does it travel slower?

Add.

1.	**2.**	**3.**	**4.**	**5.**
119	881	784	1108	747
636	381	976	509	13
95	183	880	3807	1313

6. 19 + 654 + 973
7. 1078 + 121 + 32
8. 555 + 27 + 808
9. 202 + 708 + 190
10. 9909 + 1191 + 5
11. 16 + 161 + 1161

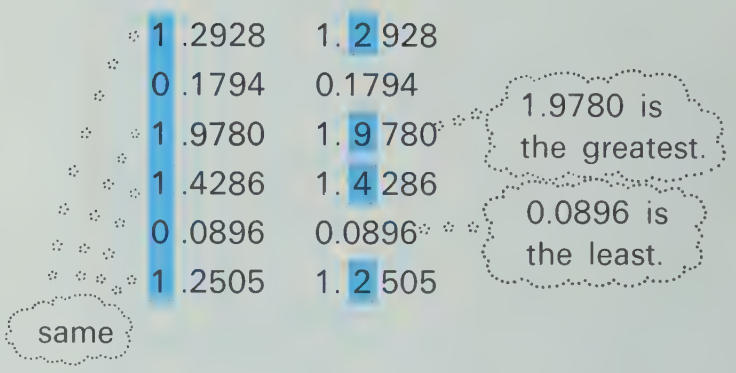
KEEPING SHARP

Ordering Decimals

This table gives the mass in grams (g) of 1 L (litre) of each of several different gases.

Gas	Mass of 1 L
Air	1.2928 g
Helium	0.1794 g
Carbon dioxide	1.978 g
Oxygen	1.4286 g
Hydrogen	0.0896 g
Nitrogen	1.2505 g

To list these gases from heaviest to lightest, first write each decimal to show the same number of digits to the right of the decimal point. Then start from the left and look at the digits place by place.



$1.9780 > 1.4286 > 1.2928 > 1.2505 > 0.1794 > 0.0896$

The gases listed from heaviest to lightest are carbon dioxide, oxygen, air, nitrogen, helium, and hydrogen.

Working Together

Write the numerals to show the same number of decimal places.

1. 1.23, 4, 6.9825, 3.1

List from least to greatest.

2. 2.4, 24.2, 24, 2.44, 0.24

Exercises

List from greatest to least.

1. 6.55, 6.555, 6.5, 6.556, 6.565
2. 1.21, 1.222, 1, 1.2122, 0.21
3. 8.88, 8.008, 80.888, 80, 8.0008
4. 93.3, 93.33, 93, 93.39, 93.399
5. 7.218, 7.281, 7.2188, 7.1288, 7
6. 0.85, 0.855, 0.8, 0.555, 0.5

List from least to greatest.

7. 4.44, 44.44, 44.4, 4.444, 4.4444
8. 0.5, 0.05, 5.05, 0.5005, 0.005
9. 2.22, 0.422, 1.92, 1.922, 1.902
10. 1.11, 1.011, 1.191, 2.001, 0.91
11. 0.0235, 0.02355, 0.352, 2.30
12. 0.0001, 0.009, 0.001, 0.0019

Helium, hydrogen, or hot air are the gases usually used in balloons.

Practice

Write the decimals.

1.

ones	tenths	hundredths	thousandths
3	5	0	9

2.

3. five-tenths

4. eighty-seven hundredths

5. seven and two-thousandths

6. nine hundred ninety-five ten-thousandths

7. nine hundred and ninety-five ten-thousandths

Write the words.

8. 6.2 **9.** 7.009 **10.** 0.1052

11. 15.015 **12.** 8.38 **13.** 1.0204

What does each 2 mean?

14. 0.4372 **15.** 1.6925 **16.** 7.2

Copy and complete.

17. 1.28, 1.29, 1.30, ▒, ▒, ▒, 1.34

18. 6.786, 6.787, 6.788, ▒, ▒, ▒, ▒

19. 0.9997, 0.9998, 0.9999, ▒, ▒, ▒

Use $>$, $<$, or $=$ to make true statements.

20. 2.988 ◯ 2.998 **21.** 6 ◯ 6.000

22. 7.3214 ◯ 7.321 **23.** 5.989 ◯ 5.99

24. 0.520 ◯ 0.52 **25.** 3.919 ◯ 3.99

List from greatest to least.

26. 3.18, 31.8, 0.318, 318.18, 3.108

27. 0.024, 2.4, 0.24, 24, 2.404

List from least to greatest.

28. 6.078, 7.860, 78.6, 60.78, 6.0078

29. 5.009, 5.0099, 5, 5.09, 5.99

Adding Decimals

When Greg made soup, he used 1.15 L of soup stock, 0.4 L of condensed tomato soup, 0.078 L of condensed vegetable soup, and 0.125 L of condensed mushroom soup. How much soup did he make?

Add 1.15, 0.4, 0.078, and 0.125.

Use the decimal points to line up the decimals.

```
    1
  1.15
  0.4
  0.078
  0.125
```

Add thousandths and regroup.

```
    1
  1.15
  0.4
  0.078
  0.125
      3
```

Add hundredths and regroup.

```
  1 1
  1.15
  0.4
  0.078
  0.125
     53
```

Add tenths.

```
  1 1 1
  1.15
  0.4
  0.078
  0.125
    753
```

Add ones.

```
  1 1 1
  1.15
  0.4
  0.078
  0.125
  1.753
```

Place the decimal point in the sum in line with those in the addends.

Greg made 1.753 L of soup.

Working Together

Line up the decimals in vertical form.

1. 0.6435 + 0.92

2. 7.75 + 10.5 + 0.3333

Add by following the steps.

3.

```
  2.4679
  1.2957
```

Add and regroup.
Add and regroup.
Add and regroup.
Add.
Add.

Add.

4.
```
  10.325
   4.905
```

5.
```
  611.68
   0.3479
```

6. 0.7 + 12.32 + 1.0057

Exercises

Add.

1. 81.67
95.84

2. 1.379
1.805

3. 32.784
7.759

4. 0.9734
0.9876

5. $2.73
1.24
3.36

6. 0.129
0.824
5.2706

7. 2.7
5.003
0.5003

8. 0.5436
0.0604
0.27

9. $12.47
4.00
1.23
3.90

10. 7.01
3.47
10.2761
6.5

11. 0.72
0.612
3.6
2.0036

12. 4.3
22.55
0.073
6.25
15.2

13. $6.73 + $5.02 + $7.10

14. $6.25 + $17.36 + $11.04

15. 4.306 + 0.5 + 1.0539

16. 5.2 + 11.0568 + 3.0094

17. 0.5815 + 5.813 + 1.5815

18. 3.1604 + 2.041 + 0.9

19. 17.306 + 21.5 + 8.06

20. 2.9641 + 17.03 + 0.899

21. 0.72 + 0.612 + 3.6 + 5.1

22. 50.02 + 2.837 + 6.04 + 7.5

For each of these, show the correct addition.

23. 0.2756
0.3085
2.315
2 8991

24. 46.23
9.1
10.46
657.9

25. 50.062
19.73
0.917
52.952

26. 17.163
1.77
153.45
502.08

Solve.

27. Janine made stew with 1.25 L of soup, 0.3 L of meat, and 0.75 L of vegetables. How much stew did she make?

28. John added 0.125 L of soup to 2.5 L of stew. How many litres of stew does he have?

29. Jerome mailed four recipe books. Their masses were 1.35 kg, 1.1 kg, 0.85 kg, and 0.455 kg. How heavy were all four books?

30. Janis mailed three packages. The postage was $0.95, $1.80, and $2.05. How much did she pay for postage for all three packages?

Adding Decimals and Whole Numbers

Rita bought 5 kg of potatoes, 1.3 kg of bananas, and 2.54 kg of tomatoes. How heavy were her groceries?

Add 5, 1.3, and 2.54.

Write 5 as 5.0.

5 is the same as 5.0.

Use the decimal points to line up the decimals. Add hundredths.

$$\begin{array}{r} 5.0 \\ 1.3 \\ 2.54 \\ \hline \end{array}$$

Add tenths.

$$\begin{array}{r} 5.0 \\ 1.3 \\ 2.54 \\ \hline 84 \end{array}$$

Add ones.

$$\begin{array}{r} 5.0 \\ 1.3 \\ 2.54 \\ \hline 8.84 \end{array}$$

Place the decimal point in the sum in line with those in the addends.

The mass of her groceries was 8.84 kg.

Working Together

Write each of these to show tenths.

1. 2 **2.** 6

Line up in vertical form. Show zeros when needed.

3. 5 + 7.2 **4.** 2.025 + 4 + 3.25

Add.

5. 17 + 6.3 **6.** 0.425 + 1 + 0.3 **7.** $2 + $6.05 + $14

Exercises

Add.

1. 2 + 5.7
2. 19.3 + 24
3. 17 + 8.4
4. 22 + 6.19
5. 21.45 + 184
6. 7 + 3.92 + 1.36
7. 4 + 8.004 + 3
8. 2 + 1.0055 + 5.619
9. 32 + 4.725 + 0.3333
10. 6.1 + 7 + 8.28
11. 5 + 3.8 + 4
12. 6.9 + 9 + 4.1
13. 8.153 + 2 + 6.437
14. 24.16 + 19.3 + 40 + 5.375
15. 8 + 14.081 + 25.1 + 5
16. 29 + 0.569 + 2.2 + 4
17. 6.3044 + 3 + 2 + 0.666 + 1.5
18. 3.005 + 6 + 1.3 + 5 + 7.02
19. 9 + 0.2 + 6.1 + 4.25 + 6.08
20. $12 + $2.85 + $6.50 + $4
21. $7.26 + $10 + $6.02 + $7
22. $6.14 + $7.32 + $1.75 + $3

Use the items in this photograph to find the mass of each of these.

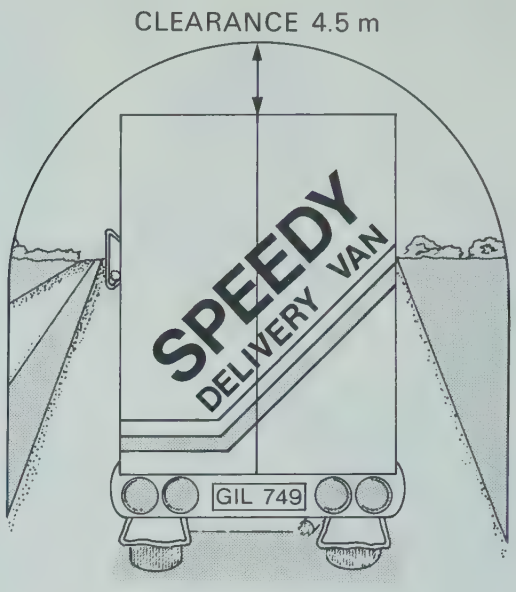
23. the potatoes and the squash
24. the pumpkin, the squash, and the grapes
25. the pineapple, the potatoes, and the pumpkin
26. the squash, the grapes, and the pineapple
27. the grapes, the potatoes, the squash, the pineapple, and the pumpkin

Subtract.

1. 5555 − 666
2. 9876 − 1234
3. 1191 − 818
4. 4321 − 1234
5. 60 855 − 40 857
6. 20 706 − 10 807
7. 1555 − 666
8. 9876 − 6789
9. 30 953 − 2095

KEEPING SHARP

Subtracting Decimals



The height of the truck is 3.97 m. What is the distance between the truck and the bridge?

Subtract 3.97 from 4.5.

Write each decimal to show the same number of digits to the right of the decimal point.

4.5 is the same as 4.50.

Use the decimal points to line up the decimals.

$$\begin{array}{r} 4.50 \\ -\ 3.97 \\ \hline \end{array}$$

Regroup 5 tenths 0 hundredths as 4 tenths 10 hundredths. Subtract hundredths.

$$\begin{array}{r} {\scriptstyle 4\ \ 10} \\ 4.\not{5}\not{0} \\ -\ 3.97 \\ \hline \qquad\ 3 \end{array}$$

Regroup 4 ones 4 tenths as 3 ones 14 tenths. Subtract tenths.

$$\begin{array}{r} {\scriptstyle 3\ \ 14\ \ 10} \\ \not{4}.\not{5}\not{0} \\ -\ 3.97 \\ \hline \qquad 53 \end{array}$$

Subtract ones.

$$\begin{array}{r} {\scriptstyle 3\ \ 14\ \ 10} \\ \not{4}.\not{5}\not{0} \\ -\ 3.97 \\ \hline 0.53 \end{array}$$

Place the decimal point in line with the others.

The distance between the truck and the bridge is 0.53 m.

The subtraction can be checked by addition.

$$\begin{array}{r} {\scriptstyle 1\ \ 1} \\ 0.53 \\ +\ 3.97 \\ \hline 4.50 \end{array}$$

If this number does not match the first number used in the subtraction, there is a mistake.

Here is another example of subtraction with decimals.

Subtract 0.9 from 1.125.

Line up the decimals.	Think of 9 tenths as 900 thousandths or 0.900.	Subtract.
1.125 0.9	1.125 0.900	1.125 0.900 0.225

Working Together

Complete this chart.

1.	7	7.0	7.00	7.000	7.0000
2.	9	?	?	?	?
3.		4.7	?	?	?
4.			6.45	?	?
5.				7.125	?

Show zeros when needed for each subtraction.

6. 13.074 − 2.6

7. 6.2 − 5.875

Show in vertical form. Show zeros when needed.

8. 5.32 − 4.986

9. 6.7936 − 2.14

Subtract. Add to check.

10. \$4.29 − 0.99

11. 62.75 − 8.9

12. 7.4 − 4.397

13. 25.702 − 9.85

14. 16.38 − 0.5279

Exercises

Subtract. Add to check the six most difficult exercises.

1. 0.9876 − 0.5321

2. 726.4 − 350.8

3. 4.613 − 2.913

4. 16.002 − 5.849

5. \$19.05 − 12.56

6. 25.702 − 9.85

7. 17.3 − 9.45

8. 57.9 − 8.425

9. 6.526 − 0.9

10. \$1.20 − 0.68

11. 40.06 − 17.96

12. 38.8 − 4.9

13. 23.54 − 9.6

14. 64.52 − 19.368

15. 9.45 − 3.7

16. 0.8 − 0.309

17. 3.3 − 2.4008

18. 84.067 − 6.4

19. 17.63 − 9.0666

20. \$6.92 − \$0.85

21. \$29.50 − \$5.90

22. \$30.00 − \$4.65

Subtracting Decimals and Whole Numbers

Debbie cut a piece of wood 1.15 m long from a board 2 m long. How long was the board that remained?

Subtract 1.15 from 2.

Write 1.15 and 2 to show the same number of digits to the right of the decimal point.

2 is the same as 2.00.

Use the decimal points to line up the decimals.

$$\begin{array}{r} 2.00 \\ 1.15 \\ \hline \end{array}$$

2 .00 shows 2 ones.
2.0 0 shows 20 tenths.

Regroup 20 tenths as 19 tenths 10 hundredths.

$$\begin{array}{r} {\scriptstyle 1\quad 9\ 10} \\ \cancel{2}.\cancel{0}\,\cancel{0} \\ 1\,.\,1\,5 \\ \hline \end{array}$$

Then subtract hundredths, tenths, and ones.

$$\begin{array}{r} {\scriptstyle 1\quad 9\ 10} \\ \cancel{2}.\cancel{0}\,\cancel{0} \\ 1\,.\,1\,5 \\ \hline 0\,.\,8\,5 \end{array}$$

The board that remained was 0.85 m long.

Here is an example of subtracting whole numbers from decimals.

Subtract 6 from 7.175.

Write 6 and 7.175 to show the same number of digits to the right of the decimal point. Line up the decimals in vertical form.

$$\begin{array}{r} 7.175 \\ 6.000 \\ \hline \end{array}$$

Subtract.

$$\begin{array}{r} 7.175 \\ 6.000 \\ \hline 1.175 \end{array}$$

Working Together

Line up in vertical form. Show zeros when needed.

1. 24 − 6.375 **2.** 6.9 − 5 **3.** $4 − $3.50

Subtract.

4. 31.05 − 6 **5.** 1 − 0.3333 **6.** $16.30 − $9

Exercises

Subtract.

1. 4.236 − 2 **2.** 7 − 0.35 **3.** 9.6 − 9
4. 18 − 3.75 **5.** 2.6666 − 1 **6.** 4.005 − 4
7. 1 − 0.0036 **8.** 12 − 6.875 **9.** 10 − 3.3333
10. $5 − $1.25 **11.** $8.78 − $6 **12.** $1 − $0.63
13. $9.45 − $4 **14.** $203 − $8.93 **15.** $18 − $7.36

Solve.

16. Brenda's parcel had a mass of 5 kg. Stan's parcel had a mass of 3.855 kg. How much heavier was Brenda's parcel than Stan's?

17. To qualify for the track team, Enid had to run around the track in 32 s. Her time was 29.88 s. How much time did she have to spare?

18. Olga had $7.38. She spent $6. How much did she have left?

19. Jerry paid $6.23 with a $10 bill. How much change did he receive?

KEEPING SHARP

Round to the

nearest ten.	nearest hundred.	nearest ten thousand.
1. 364	**3.** 556	**5.** 766 000
2. 489	**4.** 213	**6.** 521 000

nearest hundred million.	nearest billion.
7. 458 000 000	**9.** 7 934 000 000
8. 687 000 000	**10.** 9 205 000 000

Rounding Decimals

During science class, Jim found that the mass of this stone is 1.735 kg. What is the mass of the stone to the nearest kilogram?

To round a decimal to the nearest whole number,

ones	tenths	hundredths	thousandths

this place

check the digit in the tenths place.

ones	tenths	hundredths	thousandths

this place

If the digit in the tenths place is 5, 6, 7, 8, or 9, round up.

If the digit in the tenths place is 0, 1, 2, 3, or 4, round down.

For 1.735, the digit in the tenths place is 7.

Round 1.735 up.

To the nearest kilogram, the mass of the stone is 2 kg.

Working Together

When rounding to

1. the nearest one, check the digit in the __?__ place.

Would you round down or up to the nearest one?

2. the nearest tenth, check the digit in the __?__ place.

Would you round down or up to the nearest tenth?

3. 4.12 **4.** 6.948 **5.** 9.27 **6.** 0.1432

Round to the nearest

7. one.
7.2

8. tenth.
8.487

9. hundredth.
7.6813

10. thousandth.
0.2107

Exercises

Round to the nearest one.

1. 6.7	**2.** 4.37	**3.** 16.059	**4.** 47.9	**5.** 9.201
6. 5.7803	**7.** 2.907	**8.** 0.98	**9.** 220.197	**10.** 59.98

Round to the nearest tenth.

11. 0.927	**12.** 20.189	**13.** 5.55	**14.** 7.424	**15.** 6.39
16. 4.6385	**17.** 108.27	**18.** 31.43	**19.** 41.301	***20.** 0.999

Round to the nearest hundredth.

21. 5.283	**22.** 9.4358	**23.** 1.3586	**24.** 3.704	**25.** 6.007
26. 2.893	**27.** 0.214	**28.** 0.0396	**29.** 11.009	***30.** 2.995

Round to the nearest thousandth.

31. 1.2355	**32.** 3.6601	**33.** 7.2589	**34.** 0.3742	**35.** 1.4992
36. 0.9032	**37.** 2.0046	**38.** 0.5009	**39.** 1.0043	**40.** 0.0005

Solve.

41. What is the mass of Jim's stone to the nearest tenth of a kilogram?

42. What is the mass of Jim's stone to the nearest hundredth of a kilogram?

Stacey has three timers. One runs for 3 min, another runs for 5 min, and the other runs for 6 min.

1. How can she time an egg to boil for 4 min?

2. How can she time an egg to boil for 7 min?

PROBLEM SOLVING

Estimating Sums and Differences

Last week Alice spent $9.78 on gasoline for her car. This week she spent $7.83 on gasoline. About how much more did she spend on gasoline last week?

To estimate the difference of 9.78 and 7.83, round to the nearest one and subtract.

$$\begin{array}{rcl} 9.78 & \longrightarrow & 10 \\ \underline{7.83} & \longrightarrow & \underline{\ 8} \\ & & 2 \end{array}$$

Alice spent about $2 more last week on gasoline.

For the exact difference, subtract in the usual way.

$$\begin{array}{r} {\scriptstyle 8\ \ 17} \\ \not{9}.\not{7}8 \\ 7.83 \\ \hline 1.95 \end{array}$$

Alice spent exactly $1.95 more last week on gasoline.

Rounding can also help you estimate the sum.

To estimate the sum of 0.38 and 0.794, round to the nearest tenth and add.

$$\begin{array}{rcl} 0.38 & \longrightarrow & 0.4 \\ \underline{0.794} & \longrightarrow & \underline{0.8} \\ & & 1.2 \end{array}$$

For the exact sum, add in the usual way.

$$\begin{array}{r} {\scriptstyle 1\ \ 1} \\ 0.38 \\ 0.794 \\ \hline 1.174 \end{array}$$

The sum of 0.38 and 0.794 is about 1.2.

Working Together

Round to the nearest one.

1. 2.1 **2.** 6.56

Round to the nearest tenth.

3. 4.51 **4.** 0.7834

Estimate each sum.
Then find the exact sum.

5. 0.87 + 0.928

6. \$3.82 + \$3.41 + \$9.77

Estimate each difference.
Then find the exact difference.

7. 4.6 − 2.487

8. \$0.98 − \$0.28

Exercises

Estimate each sum. Then find the exact sum.

1. 1.7 8.2	**2.** 6.48 6.97	**3.** 0.3456 0.45	**4.** 5.26 0.798	**5.** \$8.96 4.54
6. 0.692 5.43 4.178	**7.** 0.2105 0.54 0.893	**8.** 4.6 7.7 2.0	**9.** 0.4965 0.73 0.2823	**10.** \$4.37 6.89 0.50

Estimate each difference. Then find the exact difference.

11. 8.9 7.1	**12.** 4.1 1.0	**13.** 0.9286 0.3700	**14.** 5.000 2.987	**15.** \$7.25 6.35
16. 6.3 4.0	**17.** 0.770 0.395	**18.** 8.98 3.98	**19.** 3.1500 2.3333	**20.** \$6.97 2.00

Estimate each result. Then find the exact result.

21. 7.669 + 7.38 **22.** 9.3 − 6.3 **23.** 5.34 − 2.6

24. 4.9 + 3.5275 + 6 + 5.485 **25.** 7.643 − 4.8764 **26.** 5.5 + 7.4

27. \$8.14 − \$2.69 **28.** \$7.03 + \$6.57 + \$4 **29.** \$6.62 − \$3.20

Solve by estimating.

30. A parcel has a mass of 3.7 kg. Another parcel has a mass of 6.5 kg. Find the difference in the masses of the parcels.

31. Ed bought bread for \$0.67, milk for \$0.84, apples for \$1.73, and tomatoes for \$0.92. About how much did he spend?

Practice

Round to the nearest one.

1. 2.831 **2.** 4.9 **3.** 1.328 **4.** 12.04 **5.** 0.9467

Round to the nearest tenth.

6. 5.624 **7.** 2.342 **8.** 17.45 **9.** 0.6432 **10.** 2.95

Round to the nearest hundredth.

11. 7.473 **12.** 1.2498 **13.** 0.731 **14.** 3.6201 **15.** 1.4005

Round to the nearest thousandth.

16. 4.2857 **17.** 0.5860 **18.** 1.3702 **19.** 4.7485 **20.** 0.9999

Estimate each sum. Then find the exact sum.

21.
$$\begin{array}{r} 4.607 \\ 1.69 \\ 4.3 \\ \hline \end{array}$$

22.
$$\begin{array}{r} 0.4792 \\ 0.86 \\ 0.9018 \\ \hline \end{array}$$

23.
$$\begin{array}{r} 2.7 \\ 4.3 \\ 1.0 \\ 9.5 \\ \hline \end{array}$$

24.
$$\begin{array}{r} 4.36 \\ 5.0 \\ 7.932 \\ 6.5 \\ \hline \end{array}$$

25.
$$\begin{array}{r} \$5.40 \\ 7.61 \\ 3.00 \\ 1.98 \\ \hline \end{array}$$

26. 2.972 + 3.18 + 4.035

27. \$9.50 + \$6.47

28. 1.254 + 3.496 + 6 + 7.08

29. \$7 + \$8.40 + \$9.67

Estimate each difference. Then find the exact difference.

30.
$$\begin{array}{r} 3.05 \\ 1.47 \\ \hline \end{array}$$

31.
$$\begin{array}{r} 5.6 \\ 3.4 \\ \hline \end{array}$$

32.
$$\begin{array}{r} 2.4 \\ 1.387 \\ \hline \end{array}$$

33.
$$\begin{array}{r} 1.1736 \\ 0.98 \\ \hline \end{array}$$

34.
$$\begin{array}{r} \$4.74 \\ 3.98 \\ \hline \end{array}$$

35. 5.932 − 1.781

36. 6.75 − 4.1

37. \$7.52 − \$5

38. 7.38 − 4

39. 1 − 0.932

40. \$9 − \$2.38

Add or subtract.

41. 14.73 + 0.964

42. 4.387 − 2.099

43. 5.32 + 7 + 6.41

44. 12.024 − 5.83

45. 6 + 3.06 + 4.1

46. 16.8 − 4.298

47. 23.087 − 3.987

48. 7.43 + 0.6211

49. 9.806 − 5

50. 1 + 0.538 + 2

51. 7 − 3.428

52. 7.38 + 2 + 9.145 + 9

53. \$3.20 − \$3

54. \$9.14 + \$7 + \$6.32

55. \$14 − \$9.36

56. \$4.72 + \$6

57. \$8.05 − \$2.19

58. \$7.39 − \$4

Find the Magic Squares.

In a Magic Square, the sums for the columns, rows, and diagonals are the same.

59.

1.2	1.7	1.6
1.9	1.5	1.1
1.4	1.3	1.8

60.

1.12	1.21	1.31
1.3	1.21	1.13
1.22	1.22	1.2

61.

32.5	15	27.25
20	25	30.5
22.5	35.5	17.75

Complete these Magic Squares.

62.

3.25	1.5	2.75
2	?	3
?	3.5	?

63.

?	?	6.75
4	6.5	9
6.25	?	?

64.

3.1	1.2	?
?	2	3.4
2.3	?	0.9

65.

?	?	0.75
?	0.625	?
0.5	?	1

66.

?	?	0.4
?	?	?
0.35	0.325	0.45

67.

?	8.25	?
?	7.75	?
7.5	7.25	?

For each of these, estimate the answer. Then find the exact answer.

68. Mark bought a jacket that was on sale for $7.98. The cost of the jacket had been $9.98. How much did Mark save by buying the jacket on sale?

69. Sheila bought a dress for $9.95, a pair of jeans for $8.80, a sweater for $6, and a belt for $2. How much did she spend?

Reasonable Measurements

To decide whether a measurement is reasonable, think about the unit of measurement and the position of the decimal point.

Mary walks 1.65 m to school.

This measurement is unreasonable. If you change the unit, the measurement is reasonable. Mary walks 1.65 km to school.

Jim's height is 13.7 cm.

This measurement is unreasonable. If you change the position of the decimal point, the measurement is reasonable. Jim's height is 137 cm.

Write each sentence giving a reasonable measurement.

Think about the unit of measurement and the position of the decimal point.

1. The width of the river is 155 cm (centimetres).
2. At the equator, the temperature at noon is about 3.5°C.
3. Irma ran 1 km in 6 s.
4. The mass of the necklace is 45 kg.
5. The aquarium holds 45 mL of water.
6. The mass of a quarter is about 500 g (grams).
7. An average letter has a mass of 1.5 kg.
8. The boy's waist measurement is 58 mm.
9. Joel drinks 0.05 L of milk every day.
10. The mass of an electric typewriter is 9.5 g.
11. The sun is about 149 000 000 cm from Earth.

PROBLEM SOLVING

Checking Up

Write the decimal for each of these.

1.

tens	ones	tenths	hundredths
1	2	0	8

2.

3. one and eight-tenths

4. seven and nine-hundredths

5. eighty-six thousandths

6. forty-five ten-thousandths

Write each of these using words.

7. 6.76 **8.** 55.3 **9.** 0.405 **10.** 22.2002 **11.** 0.2022

Write each as a four-place decimal.

12. 2.377 **13.** 4.1

Write each as a three-place decimal.

14. 6.2 **15.** 7

Write each as a two-place decimal.

16. 5.5 **17.** 6.7500

Write each as a one-place decimal.

18. 36 **19.** 4.000

Use $>$, $<$, or $=$ to make true statements.

20. 2.244 ◯ 2.2444 **21.** 9.6600 ◯ 9.66 **22.** 7.717 ◯ 7.7117

List from greatest to least.

23. 6.65, 6.6555, 6, 6.6, 6.665

List from least to greatest.

24. 1.001, 1.01, 1.0101, 1.101, 1.1

Round to the nearest

25. ten. 95.4 **26.** one. 6.84 **27.** tenth. 1.1165 **28.** hundredth. 0.7355 **29.** thousandth. 3.1489

Add.

30. $\begin{array}{r} 4.2331 \\ +\ 6.0824 \\ \hline \end{array}$ **31.** $\begin{array}{r} 13.4 \\ +\ 1.7918 \\ \hline \end{array}$

Subtract.

32. $\begin{array}{r} 4.637 \\ -\ 1.989 \\ \hline \end{array}$ **33.** $\begin{array}{r} 8.342 \\ -\ 6.9 \\ \hline \end{array}$ **34.** $\begin{array}{r} 2.9 \\ -\ 0.2437 \\ \hline \end{array}$

Find the result.

35. $9.2 + 3.497 + 2.04$ **36.** $13.17 - 11.208$ **37.** $3.94 + 6.1238$

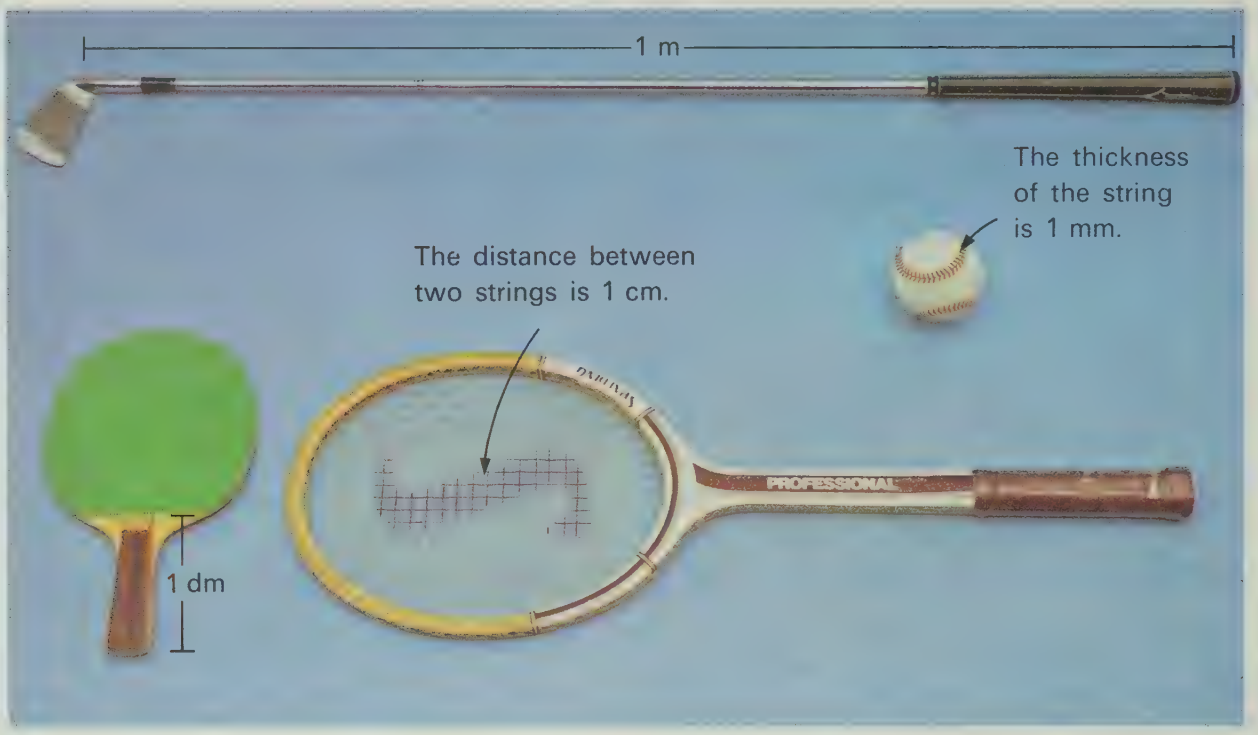
38. $1.0695 + 11 + 4.28$ **39.** $2.3942 - 1$ **40.** $1.5 - 0.611$

41. $5.0008 + 1.99 + 3$ **42.** $7.04 - 6.9981$ **43.** $100 - 0.732$

44. $\$9 + \$4.95 + \$1.45$ **45.** $\$565.72 - \$477$ **46.** $\$29 - \$11.45$

6 MEASUREMENT

Measuring and Estimating Length



To measure greater lengths, you can use the kilometre.

9 times around a baseball diamond in a stadium is about 1 km.

Working Together

Tell whether you would use millimetres, centimetres, decimetres, metres, or kilometres to measure each of these.

1. the distance you ride on a bicycle
2. the thickness of a spoke in a bicycle wheel
3. the height of a basketball hoop
4. the length of a badminton racket

Complete the chart. Choose a unit of measurement. Estimate to the nearest unit. Then measure to the nearest unit.

	Object	Unit	Estimate	Measurement
5.	the length of your classroom	?	?	?
6.	the height of your desk	?	?	?

Exercises

Choose a unit of measurement for each.

1. the distance you would travel to a nearby city
2. the width of your hand
3. the distance across a pond

Complete the chart. Choose a unit of measurement. Estimate. Then measure to the nearest unit.

	Object	Unit	Estimate	Measurement
4.	your height	?	?	?
5.	the length of your arm	?	?	?
6.	the length of your shortest finger	?	?	?
7.	the length of your pencil	?	?	?
8.	the width of your classroom	?	?	?
9.	the height of your chair	?	?	?
10.	the distance from your desk to the door	?	?	?
11.	the width of your ruler	?	?	?
12.	the height of the chalkboard	?	?	?
13.	the length of a page in this book	?	?	?
14.	the thickness of this book	?	?	?

15. Choose five items and complete a similar chart for these five items.

For each of these lengths, use a straight edge to draw a line segment that you estimate has that length. Then measure the line segment to check.

16. 5 cm **17.** 1 dm **18.** 7 mm **19.** 12 cm **20.** 1 cm

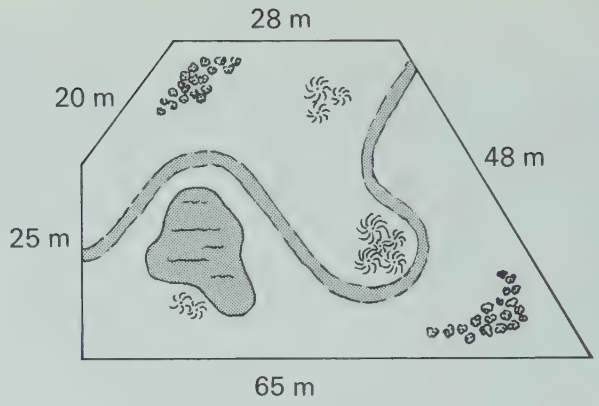
Finding Perimeter

Walter ran around the park.
How far did he run?

Add the lengths of the five sides.

$$\begin{array}{r} 65 \\ 48 \\ 28 \\ 20 \\ 25 \\ \hline 186 \end{array}$$

Walter ran 186 m around the park.

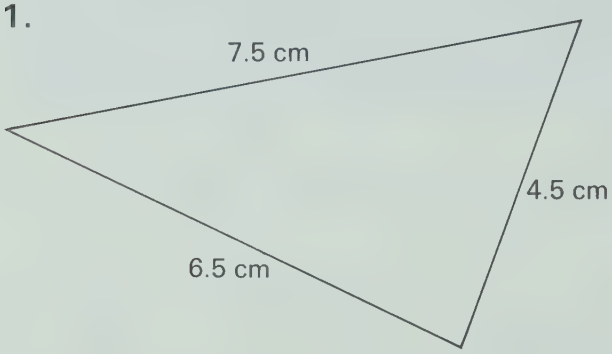


The distance around the park is the **perimeter.**

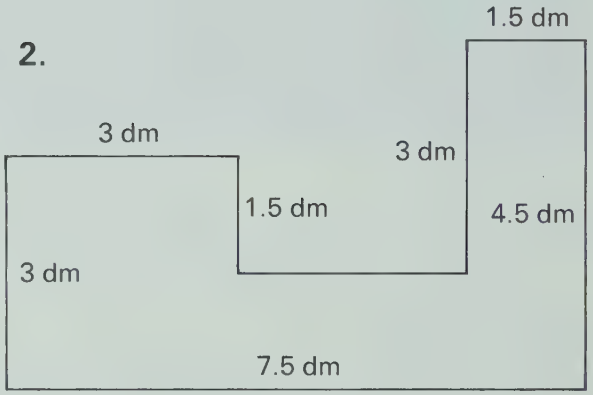
Working Together

Find the perimeter of each shape.

1.

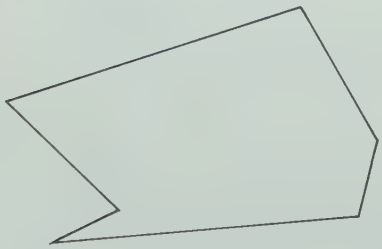


2.

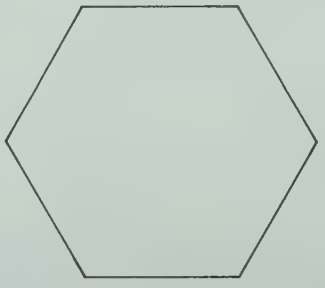


Measure to the nearest centimetre.
Then find the perimeter.

3.



4.



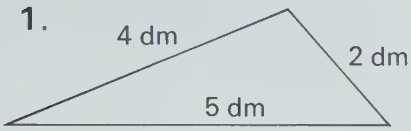
5. the top of your desk

6. the cover of this book

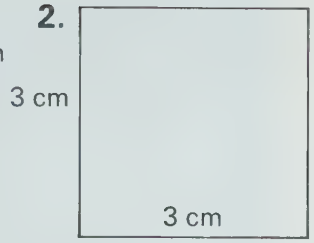
Exercises

Find the perimeter of each.

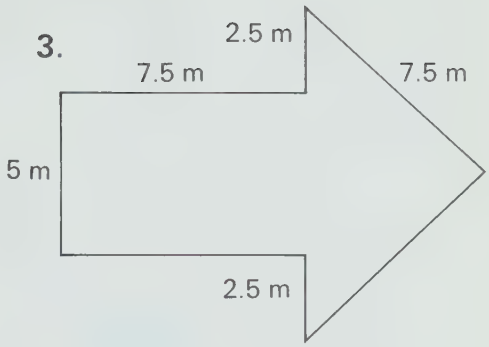
1.



2.



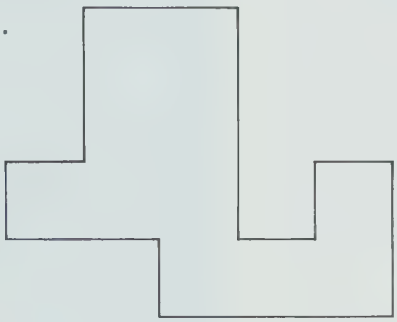
3.



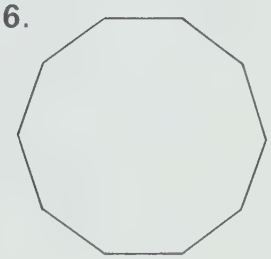
Measure to the nearest centimetre.
Then find the perimeter.

4.

5.



6.



Find the perimeter of each of these.

7. a hexagon with sides 3 cm, 3 cm, 4 cm, 2 cm, 2 cm, 4 cm

8. a polygon with sides 14 m, 15 m, 26 m, 21 m, 12 m

9. a polygon with sides 12 m, 5 m, 10 m, 5 m

10. a triangle with sides 15 mm, 15 mm, 15 mm

11. a quadrilateral with sides 5 cm, 9 cm, 8 cm, 2 cm

12. a triangle with sides 7.1 dm, 9.3 dm, 5.2 dm

13. a pentagon with sides 5.4 m, 8.2 m, 6.1 m, 7.3 m, 8.9 m

14. a polygon with sides 6.3 m, 7.1 m, 6.5 m, 9.2 m

Solve.

15. The sides of the yard at Lakeview School are 243 m, 118 m, 137 m, and 96 m. What is the perimeter of the yard?

16. The sides of a park are 107.3 m, 92.1 m, 46.5 m, and 42.0 m. How long is the fence around the park?

Use a straight edge. Draw polygons you estimate to have these perimeters. Then measure to check.

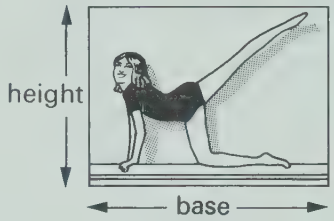
17. 8 cm **18.** 15 cm **19.** 22 cm **20.** 4 dm

Using a Rule to Find Perimeter

Stacey's poster is 61 cm by 46 cm. What length of wood does she need to frame her poster?

Add the lengths of the four sides.

$$\begin{array}{r} 61 \\ 61 \\ 46 \\ 46 \\ \hline 214 \end{array}$$



For a rectangle:

Perimeter = (2 × base) + (2 × height)
= (2 × 61) + (2 × 46)
= 122 + 92
= 214

Stacey needs a piece of wood that is 214 cm long.

Working Together

Complete the chart for **regular polygons.**

For a regular polygon, all sides have the same length and all angles have the same measurement

	Regular polygon	Number of sides	Rule for perimeter	Length of each side	Perimeter
1.	square	4	4 × side	3 cm	?
2.	pentagon	5	5 × side	2 m	?
3.	hexagon	6	?	7 cm	?
4.	octagon	8	?	9 m	?

For each, give the rule for finding the perimeter. Then find the perimeter.

5. a rectangle having a base of 4 dm and a height of 2 dm

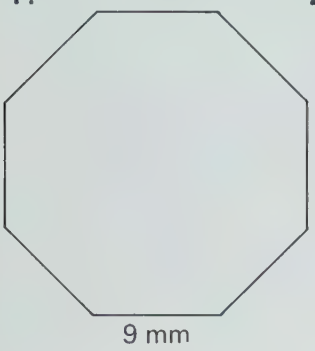
6. a square having a side of 5 cm

7. a triangle having sides of 9 m, 7 m, and 3 m

Exercises

Find the perimeter.

1.



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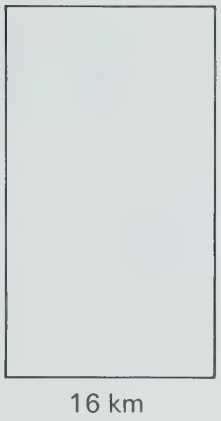


	Regular polygon	Length of each side
3.	hexagon	12 cm
4.	octagon	1 m
5.	decagon	3 dm
6.	pentagon	61 mm
7.	octagon	92 cm

8. a triangle sides of 64 mm, 27 mm, and 61 mm

9. a square, sides 15 m

10. a rectangle, 11 dm by 35 dm

11. a square, sides 432 m

12. a rectangle, base 1 km, height 5 km

13. a regular pentagon, sides 9 cm

Use a straight edge. Draw polygons you estimate to have these perimeters. Then measure to check.

14. a square with a perimeter of 25 cm

15. 3 different rectangles, each with a perimeter of 24 cm

Solve.

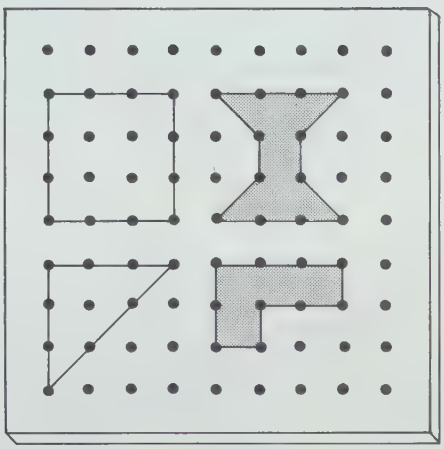
16. A gym floor is 32 m long and 18 m wide. What is its perimeter?

17. A gymnastics mat is 61 cm wide and 152 cm long. What is its perimeter?

Which has a greater perimeter, the first shape or the second shape?

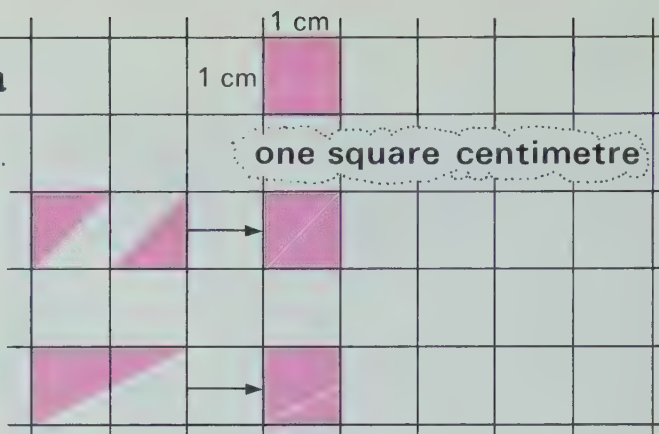
1.

2.



try this

Counting to Find the Area



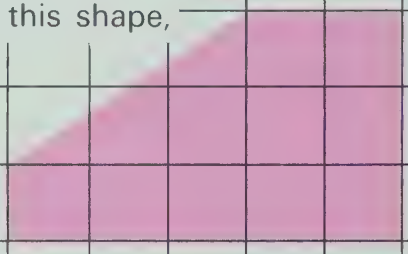
The side of each square is 1 cm long.
The **area** of each square is 1 cm^2.

Two halves of a square centimetre equal 1 cm^2.

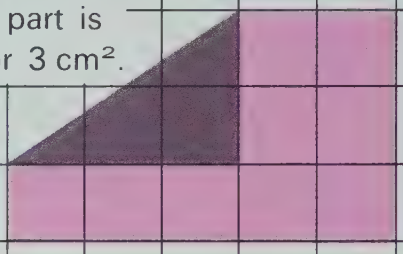
One-half of 2 cm^2 equals 1 cm^2.

When one side of a shape is diagonal on the grid, finding a rectangle for that diagonal can help you find the area of the shape.

For this shape,



the area of this part is half of 6 cm^2, or 3 cm^2.



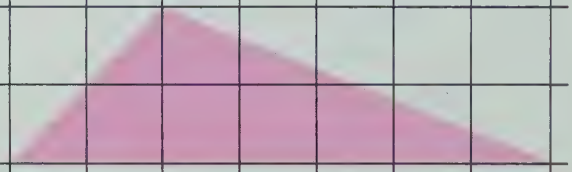
The area of the whole shape is 12 cm^2.

Working Together

Find the area of each shape in square centimetres.

1.

2.

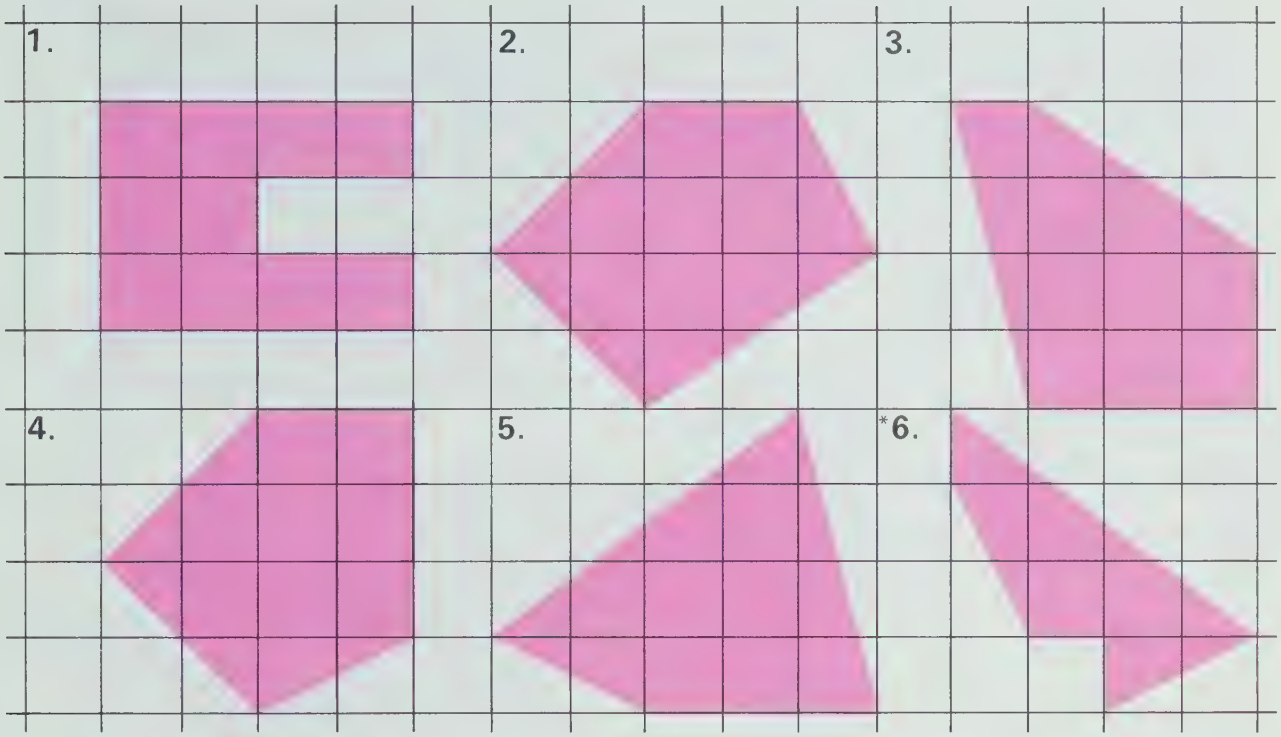


3.

4.

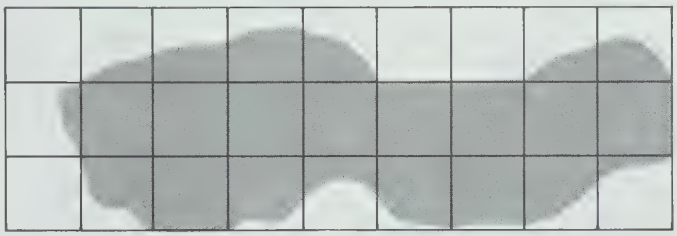
Exercises

Find the area of each shape in square centimetres.



Use grid paper.

9. Draw 3 shapes that have an area of 4 cm^2.



This shows a small pond.
Each square represents 1 m^2.

1. How many squares are completely covered by the pond?

2. How many squares are covered or partly covered by the pond?

3. The area of the pond is between ____ m^2 and ____ m^2.

4. How would you estimate the area of the pond?

PROBLEM SOLVING

Using a Rule to Find Area

What is the area of each card?

The centimetre squares
are in rows and columns.

For Hilda's card: 5 rows, 6 columns

$5 \times 6 = 30$

Area = 30 cm²

For a rectangle:

Area = base × height
= 6 × 5
= 30

The area of Hilda's card is 30 cm².

For Cecil's card: 5 rows, 5 columns

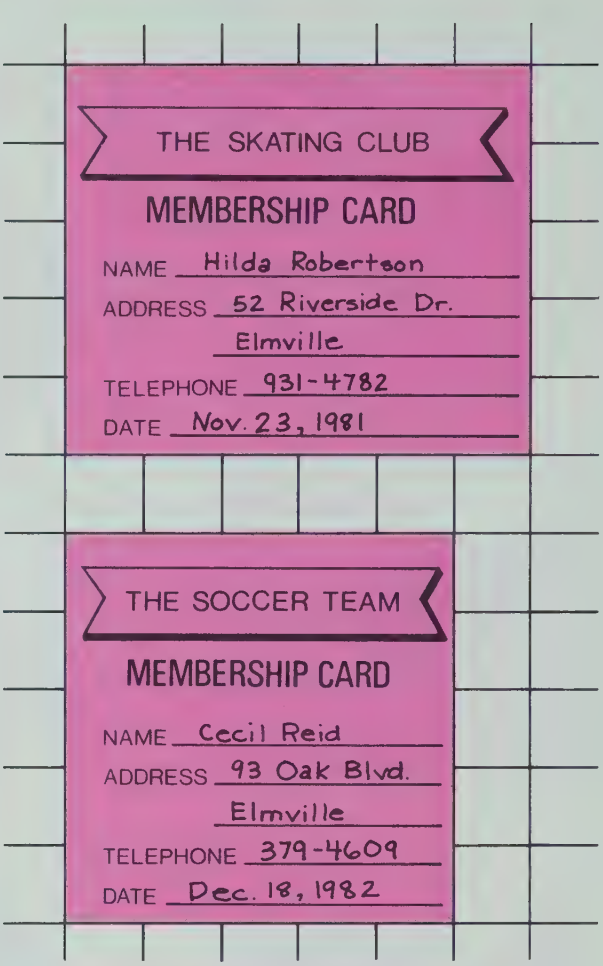
$5 \times 5 = 25$

Area = 25 cm²

For a square:

Area = side × side
= 5 × 5
= 25

The area of Cecil's card is 25 cm².



Working Together

Give the rule for finding the area.
Then find the area.

1.

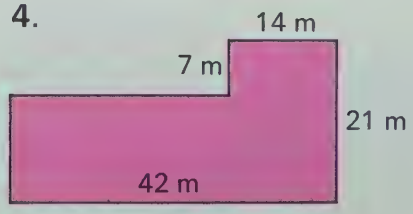
2. a rectangle 9 cm by 7 cm

3. a square, sides 27 dm

Divide the region into rectangles.
Then find the area.

A square is also a rectangle.

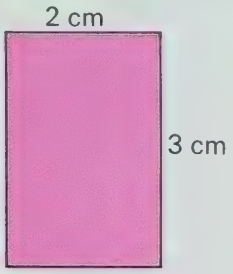
4.



Exercises

Find the area.

1.



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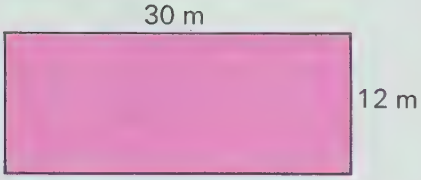

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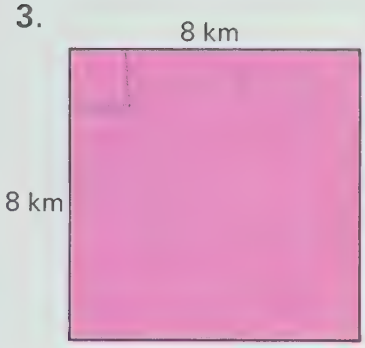
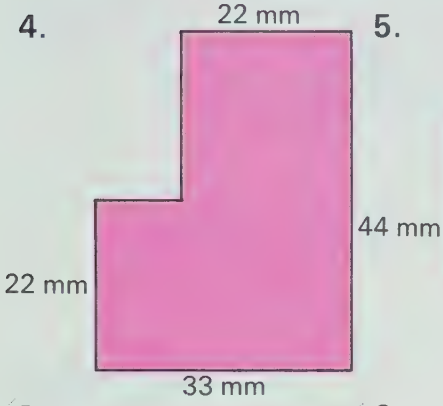
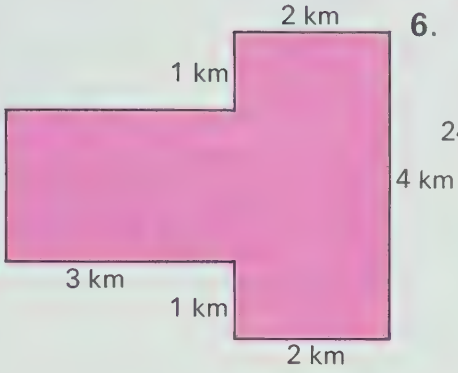


4.



5.



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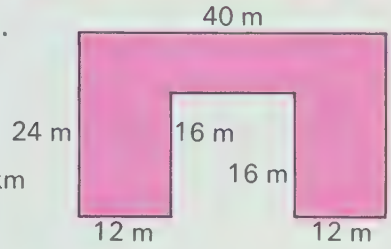

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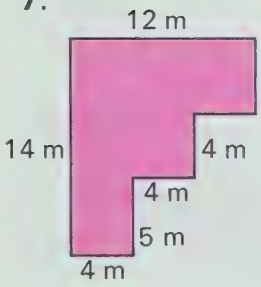
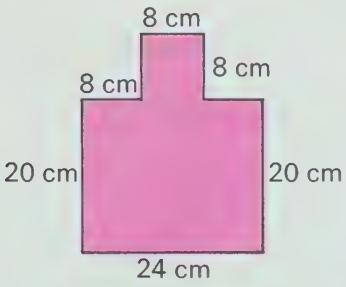
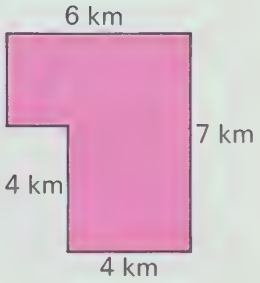


8.



9.



Complete the chart for each rectangle.

	Base	Height	Area
10.	36 cm	24 cm	?
11.	19 m	47 m	?
12.	1 dm	102 dm	?
***13.**	?	9 km	45 km^2
***14.**	16 m	?	384 m^2

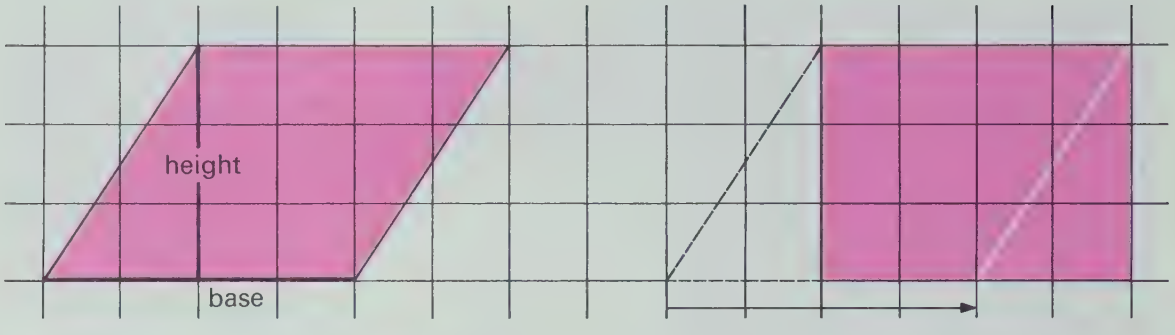
Complete the chart for each square.

	Base	Area
15.	87 m	?
16.	1 mm	?
17.	38 cm	?
18.	163 m	?
***19.**	?	1 km^2

Finding the Area of a Parallelogram

Slide part
of the parallelogram . . .

. . . to make a rectangle.



The area of the rectangle is 12 cm², so the area of the parallelogram is 12 cm².

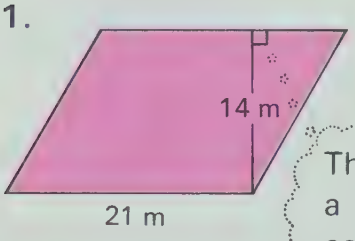
For a parallelogram:
Area = base × height
= 4 × 3
= 12

The area of the parallelogram is 12 cm².

Working Together

Give the base.

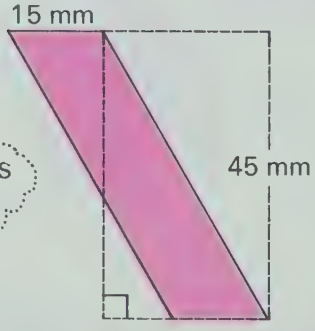
1.



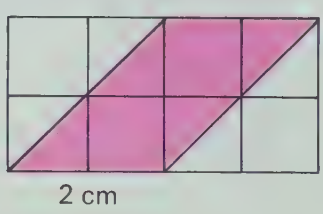
This means a square corner.

Give the height.

2.



3.

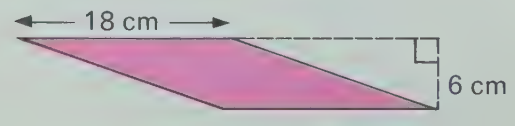


Give the rule for finding the area.

4. a parallelogram having
a base of 7 m and a height of 9 m

Find the area.

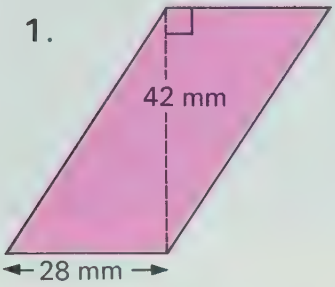
5.



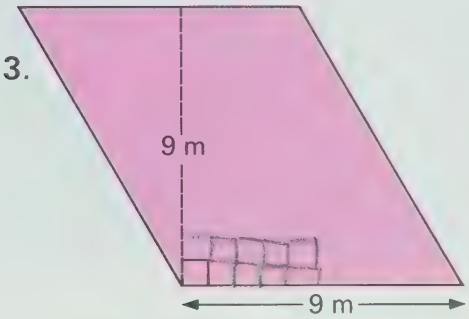
6. a parallelogram having
a base of 17 dm and
a height of 24 dm

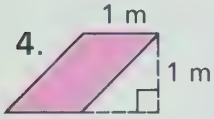
Exercises

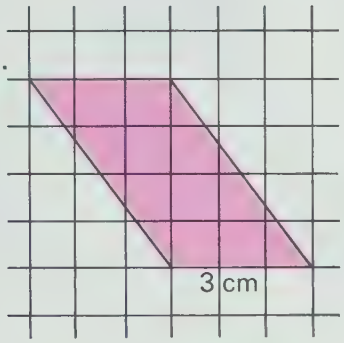
Find the area.

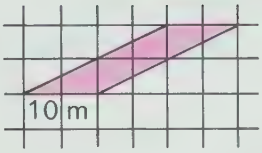
1. 

2.

3. 

4. 

5. 

6. 

Complete the chart for each parallelogram.

	Base	Height	Area
7.	94 m	73 m	?
8.	16 mm	9 mm	?
9.	1 dm	8 dm	?
10.	107 m	58 m	?
11.	4 km	5 km	?
12.	7 cm	8 cm	?
13.	85 m	30 m	?
14.	4 km	1 km	?
15.	62 cm	49 cm	?
16.	1 mm	1 mm	?
***17.**	25 cm	?	625 cm^2
***18.**	?	8 km	96 km^2
***19.**	?	19 mm	152 mm^2
***20.**	45 m	?	135 m^2

Complete the table beginning with a square 1 m by 1 m, and then doubling the dimensions for each square.

	Base	Height	Perimeter	Area
1.	1 m	1 m	?	?
2.	2 m	2 m	?	?
3.	4 m	4 m	?	?
4.	8 m	8 m	?	?
5.	16 m	16 m	?	?
6.	?	?	?	?
7.	?	?	?	?
8.	?	?	?	?

9. What patterns can you find?

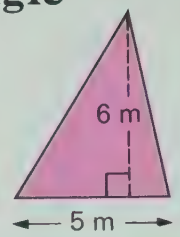
Make a similar table beginning with a rectangle 3 cm by 1 cm.

10. What patterns can you find in this table?

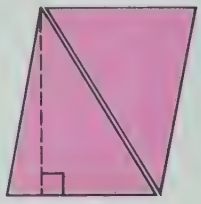
try this

Finding the Area of a Triangle

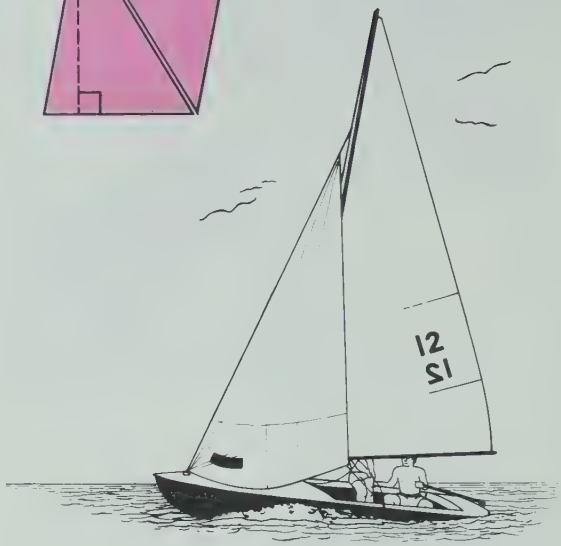
This sail has the shape of a triangle.
The base of the triangle is 5 m.
The height of the triangle is 6 m.
What is the area of the sail?



Two triangles fit together
to make a parallelogram.



The area of the triangle is half the
area of the parallelogram, or half
the product of the base and the height.



For a triangle:

$$\text{Area} = \frac{\text{base} \times \text{height}}{2}$$

$$= \frac{5 \times 6}{2}$$

$$= \frac{30}{2}$$

$\frac{30}{2}$ means $30 \div 2$

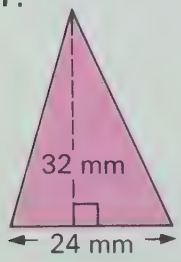
$$= 15$$

The area of the sail is 15 m^2.

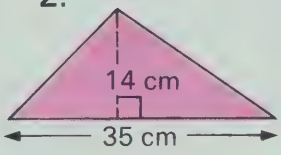
Working Together

Give the base. Give the height.

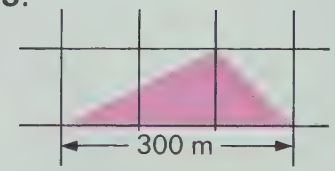
1.



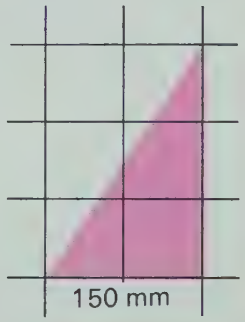
2.



3.



4.



Give the rule

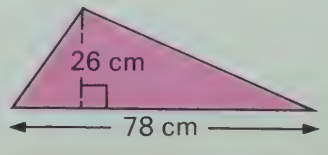
5. for finding the area of a triangle.

Find the area.

6. a triangle, base 15 m, height 10 m

7. a triangle, base 10 dm, height 15 dm

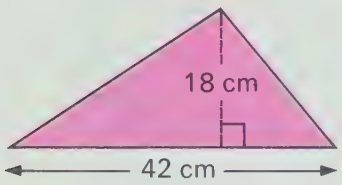
8.



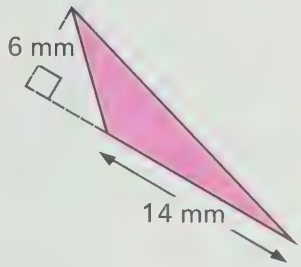
Exercises

Use the rule to find the area.

1.



2.



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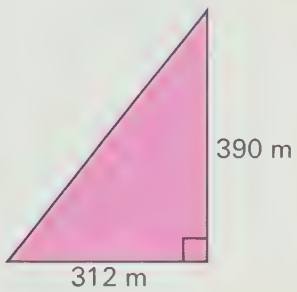

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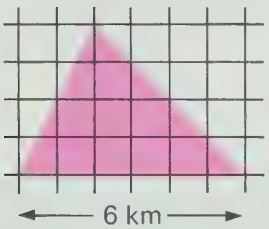

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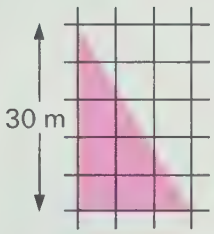

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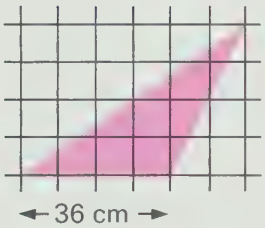


Copy and complete the chart for each triangle.

	Base	Height	Area
7.	19 m	56 m	?
8.	63 cm	184 cm	?
9.	23 mm	4 mm	?
10.	1 km	10 km	?
11.	43 cm	106 cm	?
***12.**	3 m	?	24 m^2
***13.**	?	8 dm	64 dm^2
***14.**	16 mm	?	192 mm^2

Solve.

15. A triangle has a height of 8 cm and a base of 12 cm. What is its area?

16. What is the area of a triangular sail with a base of 12 m and a height of 16 m?

***17.** A triangular sail has a base of 15 m and an area of 300 m^2. What is the height of the sail?

Practice

Choose the possible units of measurement.

1. Area of a triangle: cm, cm^2, m^2, km, mm^2
2. Perimeter of a square: m, km^2, mm, m^2

Complete the charts.

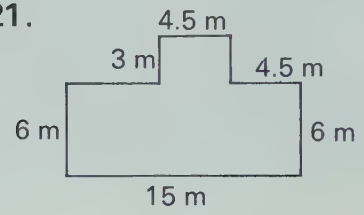
	Regular polygon	Length of each side	Perimeter
3.	octagon	7 m	?
4.	hexagon	23 cm	?
5.	pentagon	36 m	?
6.	decagon	15 dm	?
7.	hexagon	46 mm	?
*8.	pentagon	?	100 cm

	Polygon	Base	Height	Perimeter
9.	rectangle	15 mm	17 mm	?
10.	rectangle	107 m	59 m	?
11.	square	48 cm	?	?
12.	square	?	12 m	?
*13.	rectangle	?	3 dm	114 dm

	Polygon	Base	Height	Area
14.	rectangle	15 m	74 m	?
15.	parallelogram	5 mm	7 mm	?
16.	triangle	8 cm	11 cm	?
17.	square	68 cm	?	?
*18.	parallelogram	103 m	?	8446 m^2
*19.	rectangle	?	19 cm	437 cm^2
*20.	triangle	6 dm	?	24 dm^2

Find the perimeter.

21.



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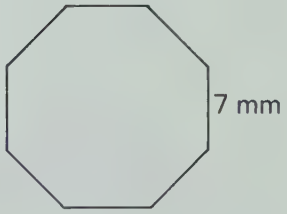
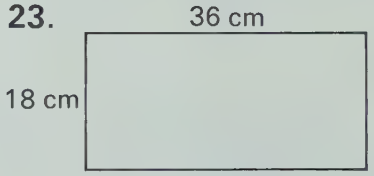
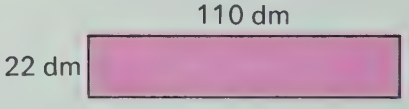


23.



Find the area.

24.



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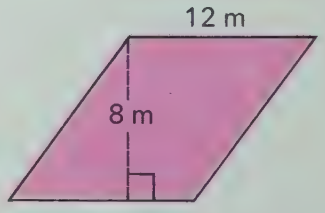

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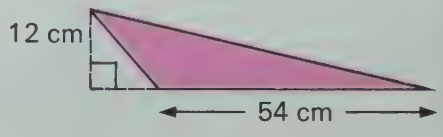
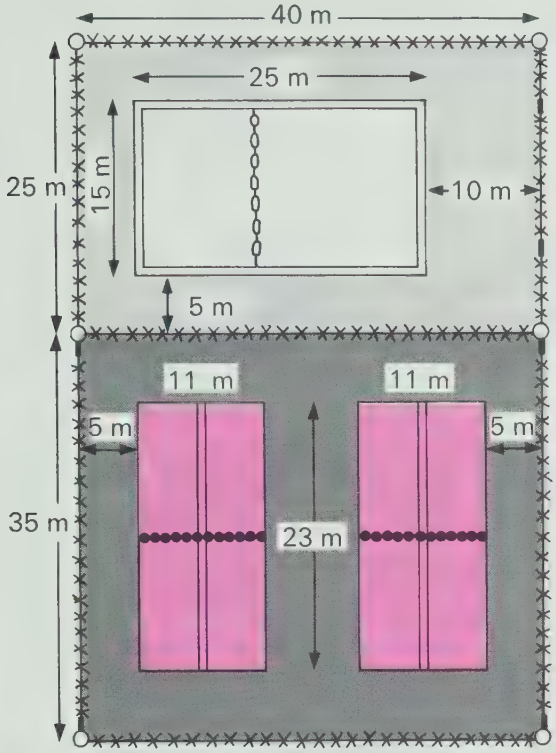


The park has a swimming pool and two tennis courts.



Legend

- swimming pool
- tennis courts
- concrete
- clay
- fence
- gate (Each gate is 1 m wide.)
- tennis net

27. What is the perimeter of the swimming pool?

28. What is the area of the pool?

29. What area is covered by the tennis courts?

30. What is the perimeter of each tennis court?

31. How much greater is the area of the tennis courts than the area of the pool?

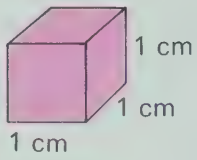
32. Which has the smaller area, the clay or the concrete?

33. Which has the greater area, the pool or the concrete?

34. How long is the fencing in and around the park?

Finding Volume by Counting Cubes

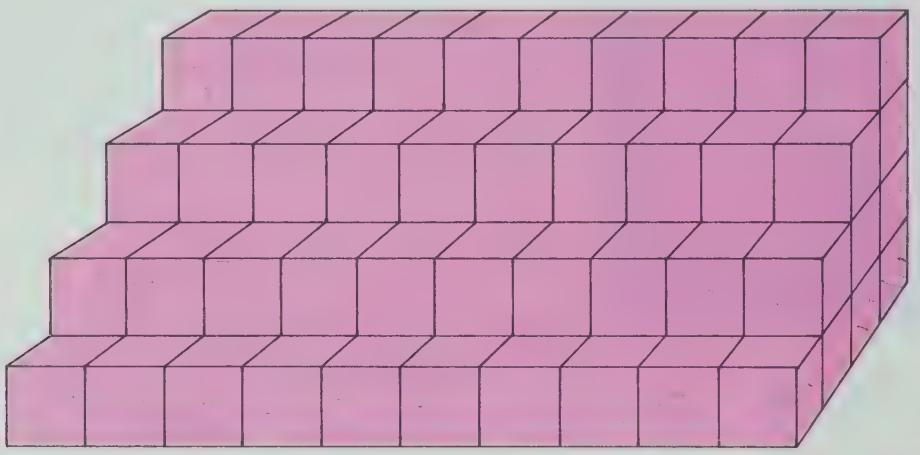
Each edge of the cube is 1 cm long.



The **volume** of the cube is **one cubic centimetre**, or **1 cm³**.

You can find volume by counting centimetre cubes.

Remember the hidden cubes.

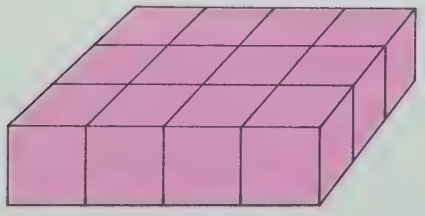


100 cm³

Exercises

Find the volume in cubic centimetres.

1.



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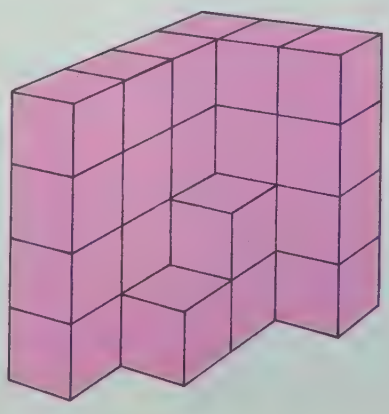

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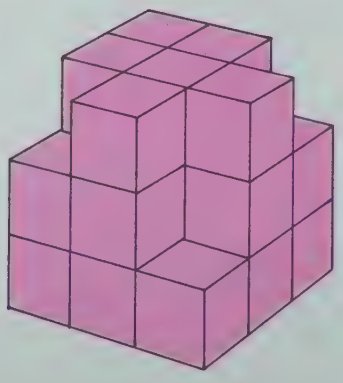
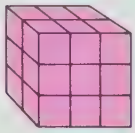


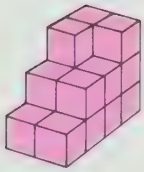
Find the volume.
Each cube represents a cubic centimetre.

4.

5.



6.



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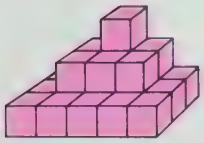
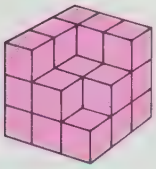


8.



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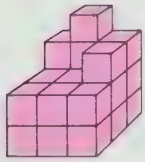


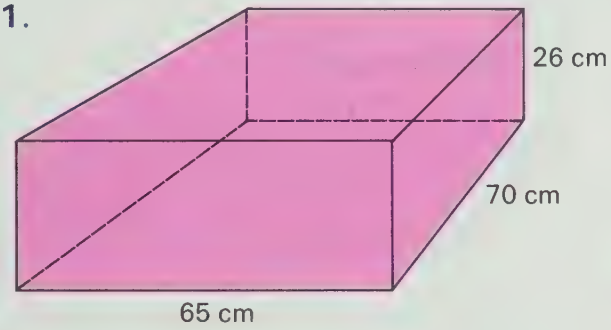
Draw

10. three different shapes with a volume of 24 cm^3.

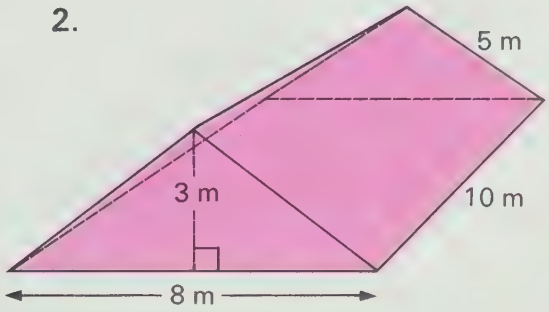
The **surface area** of a solid
is the area of its whole surface.
To find the surface area,
find the area of each face.
Then add the areas of all the faces.

Find the surface area of each.

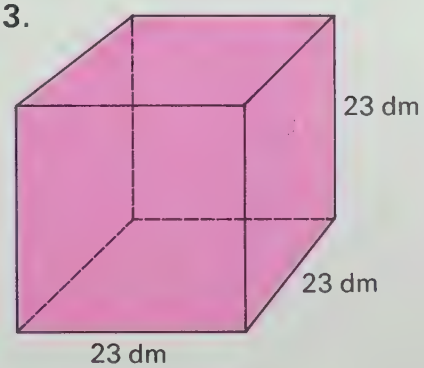
1.



2.



3.



4. a book

5. an object in your classroom

try this

Finding Volume from Cubic Units in Layers

Each surface of a rectangular prism is a rectangle.

Find the volume of the **rectangular prism**.

Each layer contains the same number of centimetre cubes.

For the bottom layer,

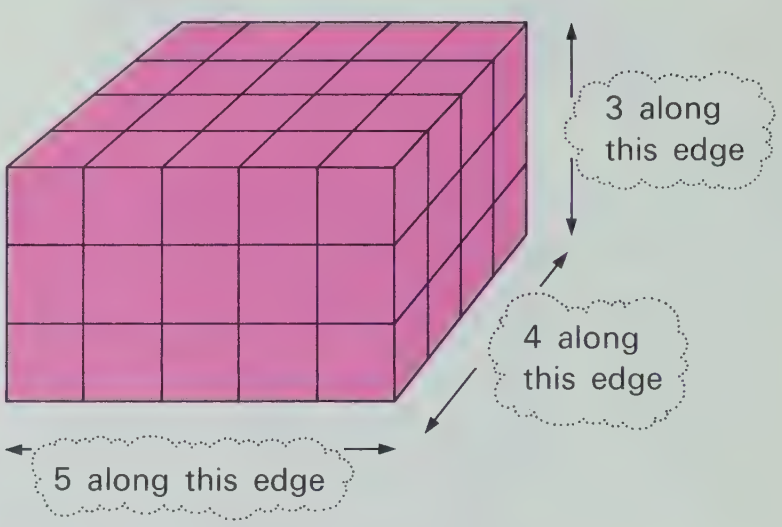
$5 \times 4 = 20$

there are 20 cubes.

There are 3 layers

$3 \times 20 = 60$

or 60 cubes in all.

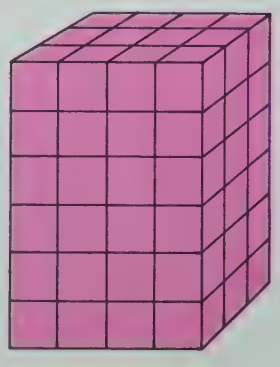


Volume = number of cubes in each layer × number of layers
= 20 × 3
= 60

The volume of the rectangular prism is 60 cm^3.

Working Together

Complete the chart for this rectangular prism. Each cube represents a cubic centimetre.

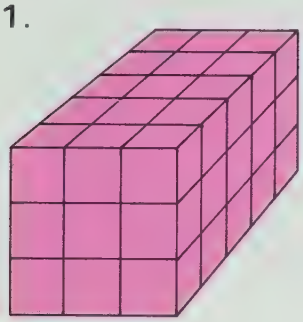


1.	Does each layer contain the same number of cubes?	?
	Number of cubes in each layer	?
	Number of layers	?
	Volume	?

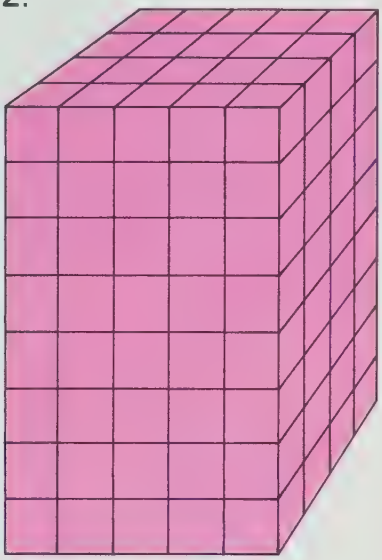
Exercises

Find the volume of each rectangular prism.
Each cube represents a cubic centimetre.

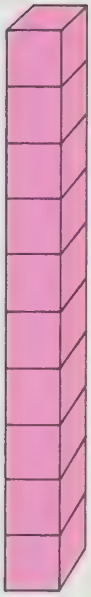
1.



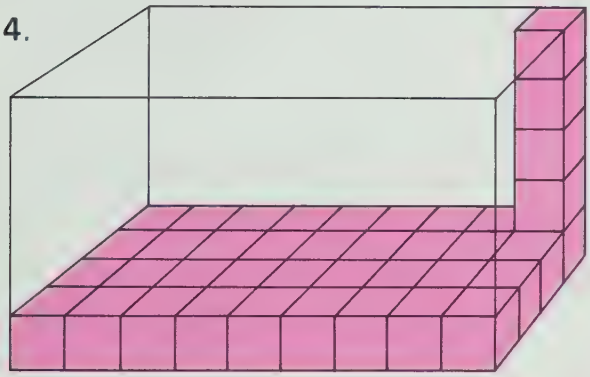
2.



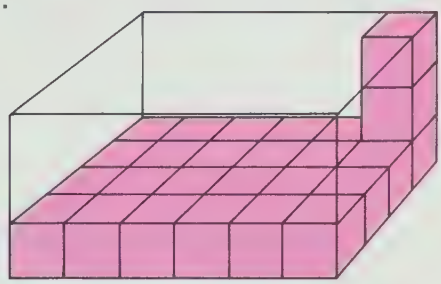
3.



4.



5.

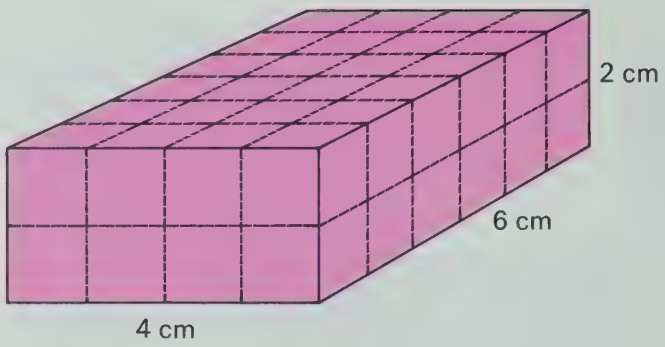


Copy and complete the chart for each rectangular prism made of centimetre cubes.

	Cubes in each layer	Number of layers	Volume
6.	8	7	?
7.	12	9	?
8.	25	73	?
9.	182	98	?
***10.**	6	?	84 cm^3
***11.**	?	15	330 cm^3

Finding the Volume of a Rectangular Prism by Multiplying the Area of the Base and the Height

Find the volume of this rectangular prism.



For the bottom layer,

$4 \times 6 = 24$

there are 24 cubes.

There are 2 layers

2×24

or 48 cubes in all.

Volume
= cubes in each layer × number of layers
= 24 × 2
= 48

The volume of the prism is 48 cm^3.

The area of the base

$4 \times 6 = 24$

is 24 cm^2.

The height is 2 cm.

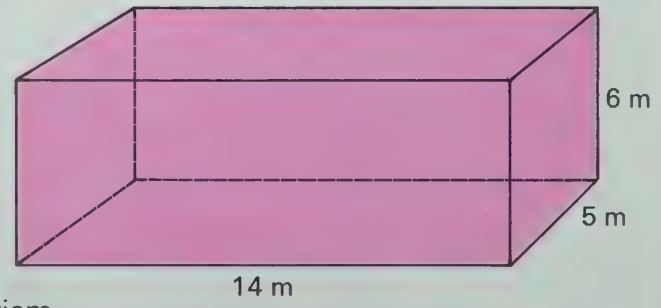
There are 2 × 24,
or 48 cm^3 in all.

Volume
= area of base × height
= 24 × 2
= 48

The volume of the prism is 48 cm^3.

Working Together

Complete the chart for this rectangular prism.



1.

Area of base	Height	Volume
?	?	?

Find the volume of each rectangular prism.

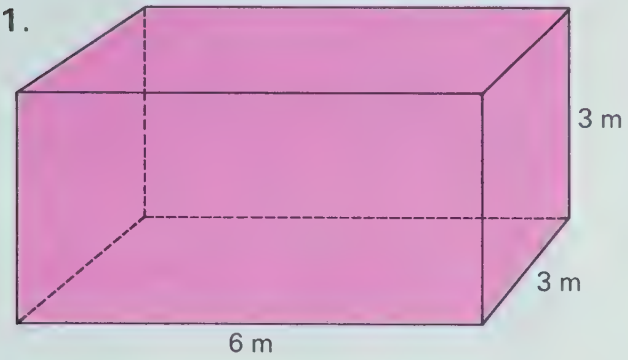
2. Base is 8 cm by 4 cm.
Height is 6 cm.

3. Base is 2 dm by 1 dm.
Height is 9 dm.

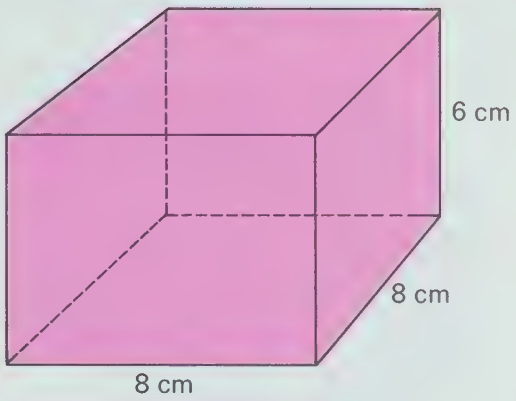
Exercises

Find the volume of each rectangular prism.

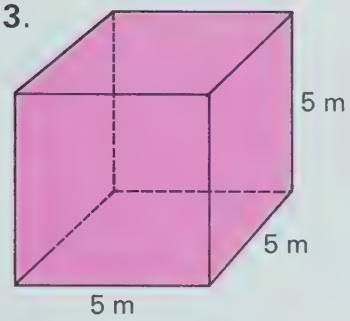
1.



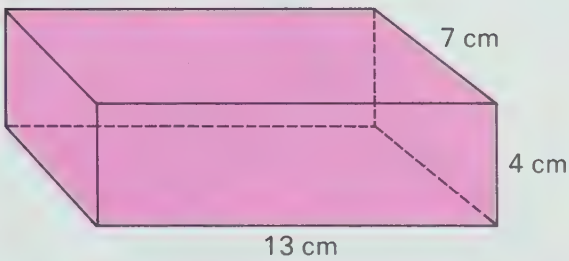
2.



3.



4.



Find the volume of each rectangular prism.

	Base	Height
5.	5 cm by 2 cm	3 cm
6.	25 m by 25 m	25 m
7.	10 m by 7 m	20 m
8.	82 cm by 6 cm	100 cm
9.	100 dm by 100 dm	100 dm
10.	22 cm by 15 cm	6 cm
11.	15 m by 15 m	15 m
12.	20 dm by 61 dm	43 dm

Solve.

13. A soccer team has a storage box 49 cm wide, 105 cm long, and 50 cm high. What is its volume?

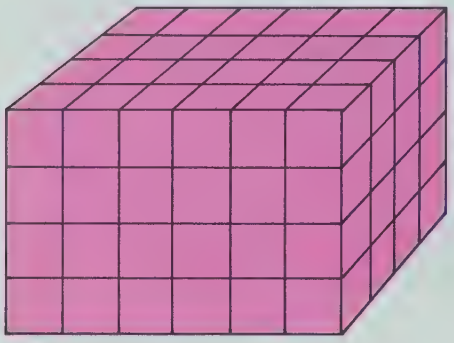
14. A carton has a base 80 cm by 96 cm and is 55 cm high. How many boxes with a base 8 cm by 8 cm and a height of 11 cm would fit in the carton?

***15.** A carton has a base 112 cm by 72 cm and a height of 84 cm. How many boxes with a base 9 cm by 16 cm and a height of 15 cm would fit in the carton?

Practice

Find the volume.
Each cube represents a cubic centimetre.

1.



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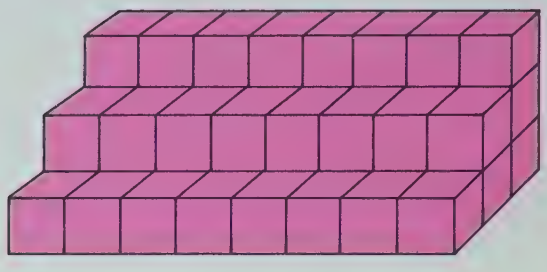

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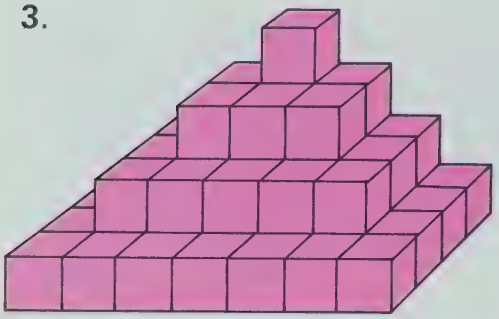

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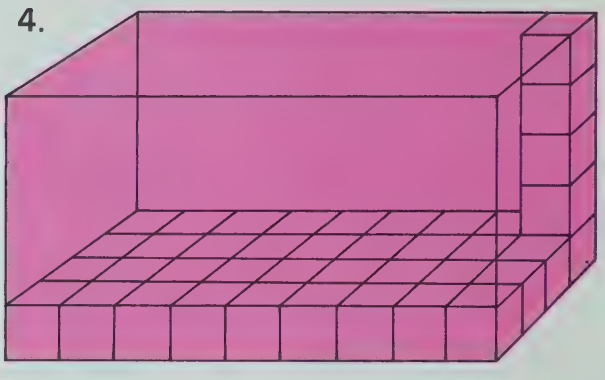
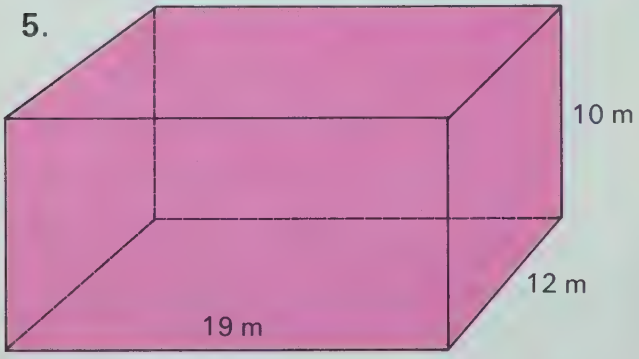
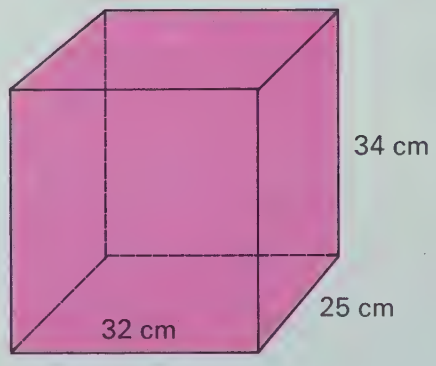


Find the volume of each rectangular prism.

5.



6.



7. Base is 9 cm by 6 cm.
Height is 8 cm.

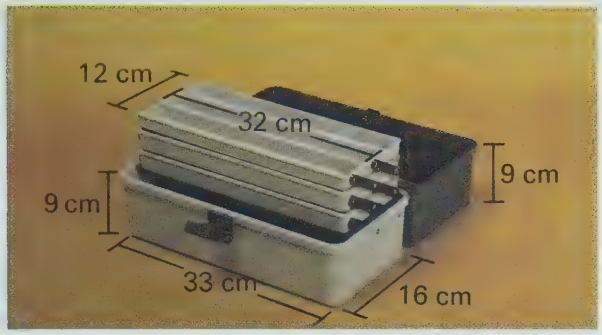
8. Base is 183 cm by 35 cm.
Height is 2 cm.

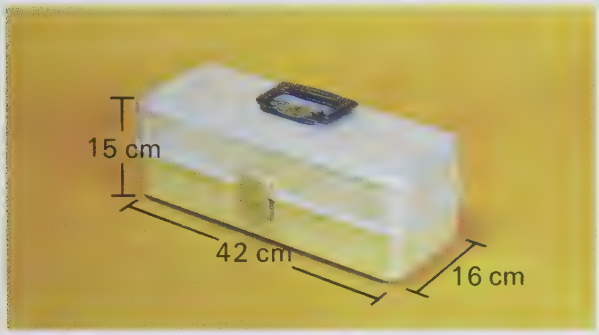
9. Base is 20 m by 91 m.
Height is 40 m.

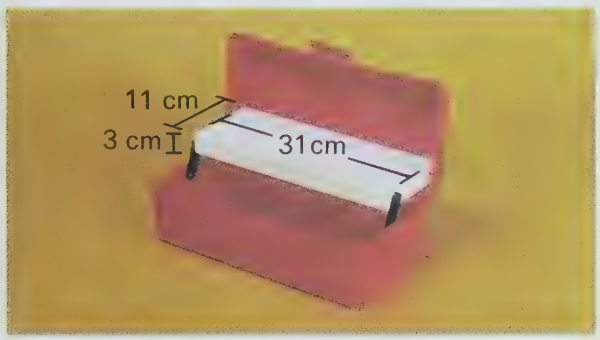
10. Base is 4 dm by 860 dm.
Height is 34 dm.

11. Base is 100 m by 100 m.
Height is 10 m.

12. Base is 73 m by 60 m.
Height is 85 m.







Solve.

13. What is the volume of the brown fishing tackle box?

14. How much greater is the volume of the silver tackle box than the volume of the brown tackle box?

15. What is the area of the tray in the red tackle box?

16. What is the volume of the tray in the red tackle box?

17. What is the area of one tray in the brown tackle box?

Add.

1. 38 764 + 53 829

2. 72 941 + 25 308 + 921

3. 10.58 + 9.56

4. 0.467 + 5.296

Subtract.

5. 31 108 − 2 347

6. 70 039 − 52 986

7. 42.78 − 33.14

8. 7.001 − 0.439

Multiply.

9. 305 × 68

10. 438 × 507

11. 600 × 679

12. 871 × 583

Divide.

13. $40\overline{)287}$

14. $71\overline{)382}$

15. 68 287 ÷ 64

16. 40 023 ÷ 631

Find the result.

17. 785 + (9207 − 4608)

18. 230 − (90.46 + 55.76)

19. (42 416 ÷ 482) ÷ 44

20. 609 × (4725 ÷ 63)

21. 34 960 ÷ (23 × 38)

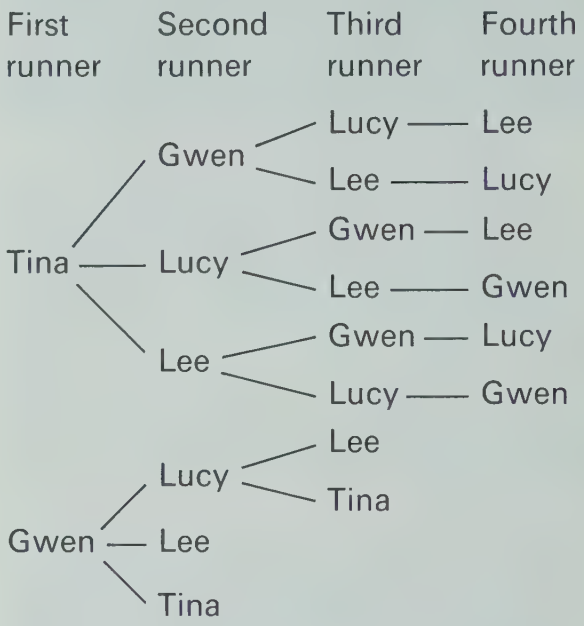
KEEPING SHARP

Finding the Number of Possibilities

Tina, Gwen, Lucy, and Lee are on a relay team. How many possible choices are there for the order of the runners on the team?

Any of the 4 girls can be first. Any of the remaining 3 girls can be second. Either of the remaining 2 girls can be third. The remaining girl would be fourth.

To find the possible choices, you can draw a **tree diagram.**



The tree diagram shows that there are 6 possible choices, if Tina is the first runner.

1. Complete the diagram to show the possible choices for the runners if Gwen is first.

2. Complete the other diagrams to show all the possibilities for the order of the runners.

Draw a diagram that shows the possible choices for each. Then give the number of possible choices.

3. If 3 girls are running on a relay team, how many possible choices are there for the order of the runners?

4. If 5 girls are swimming on a relay team, how many possible choices are there for the order of the swimmers?

5. If 15 boys are racing, how many different possibilities are there for first place?

6. If 15 boys are racing, how many possibilities are there for second place after one has crossed the finish line?

7. If 4 boys are racing, how many different ways can they finish the race?

PROBLEM SOLVING

Checking Up

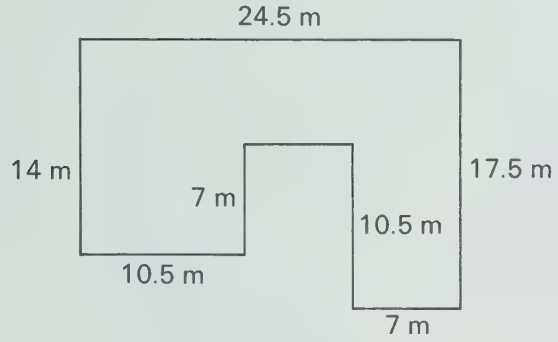
Choose the best unit to measure each.

1. the distance between cities

2. the length of a tennis racket

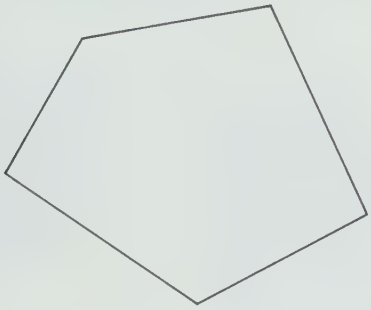
Find the perimeter.

3.



Measure to the nearest millimetre. Then find the perimeter.

4.



Find the perimeter of each.

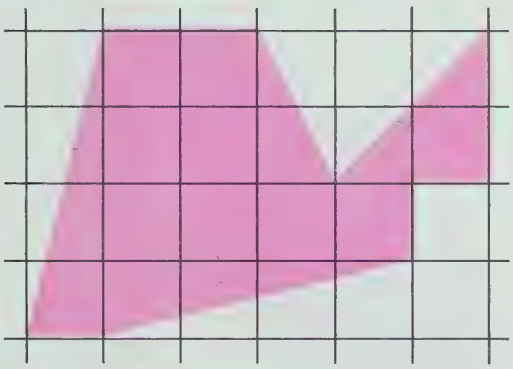
5. a rectangle 14 m by 35 m

6. a square with sides 93 mm

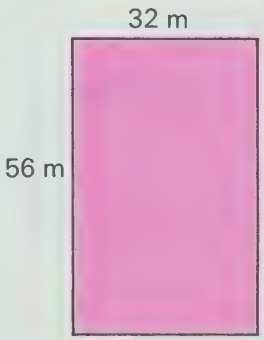
Find the area in square centimetres.

Find the area.

7.



8.



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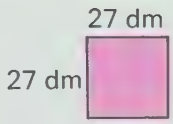

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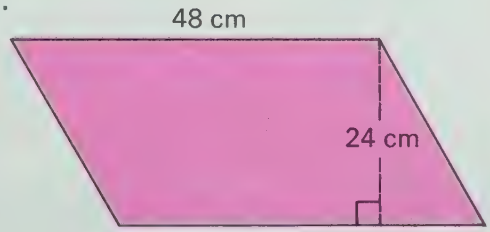

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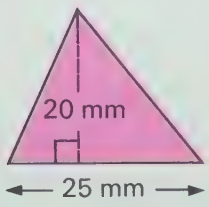
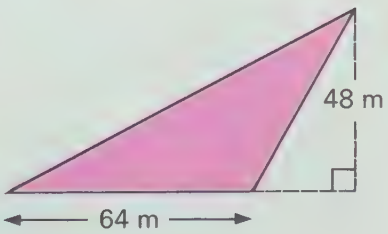


12.



Turn the page for more exercises.

Find the area of each.

13. a rectangle 17 cm by 14 cm

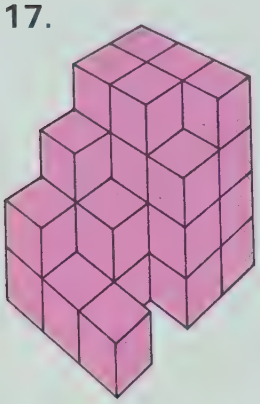
14. a square with sides 32 m

15. a parallelogram with height 64 mm and base 93 mm

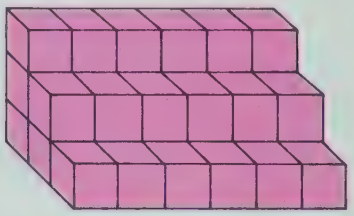
16. a triangle with height 14 m and base 95 m

Find the volume.
Each cube represents one cubic centimetre.

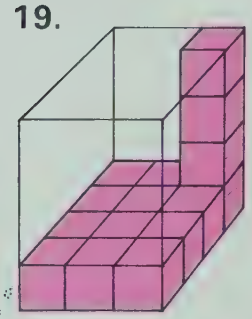
17.



18.



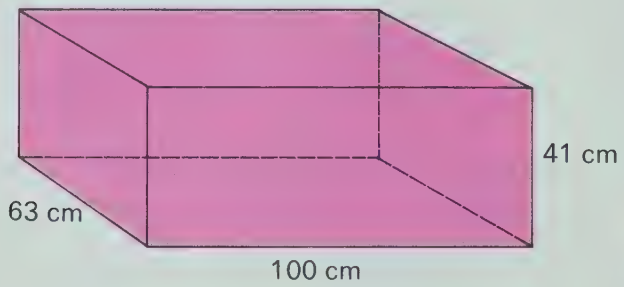
19.



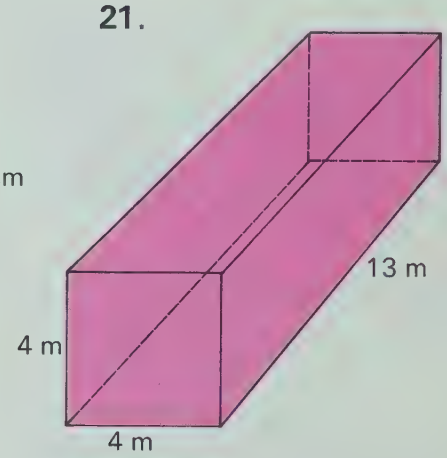
How many cubes will fill this rectangular prism?

Find the volume.

20.



21.



22. Base is 17 m by 16 m. Height is 22 m.

23. Base is 1 dm by 52 dm. Height is 13 dm.

Solve.

24. How long is a fence around a skating rink 21 m by 15 m?

25. What is the area of a gymnastics mat 205 cm by 180 cm?

26. A box of golf tees is 44 cm long, 41 cm wide, and 46 cm high. What is its volume?

27. A triangular sign with a base of 122 cm is 92 cm high. What is its area?

Checking Skills

Multiply.

1. 6427×9
2. $85\,319 \times 8$
3. 346×30
4. 975×70
5. 48×99
6. 306×62
7. 379×400
8. 492×800
9. 276×108
10. 815×570
11. 405×937
12. 683×642

Divide.

13. $6\overline{)427}$
14. $9\overline{)8570}$
15. $10\overline{)6703}$
16. $30\overline{)19\,203}$
17. $68\overline{)7223}$
18. $43\overline{)8869}$
19. $92\overline{)50\,320}$
20. $79\overline{)64\,312}$
21. $87\overline{)9310}$
22. $64\overline{)5545}$
23. $26\overline{)80\,540}$
24. $98\overline{)69\,770}$
25. $200\overline{)1387}$
26. $700\overline{)91\,324}$
27. $570\overline{)76\,002}$
28. $430\overline{)30\,100}$
29. $625\overline{)73\,842}$
30. $751\overline{)64\,853}$
31. $204\overline{)52\,287}$
32. $943\overline{)99\,463}$

Add or subtract.

1. $24.98 + 12.74 + 33.56$
2. $96.502 - 28.431$
3. $6.8 + 9.2 + 3.5 + 6.1 + 4.4$
4. $2.32 + 4.76 + 9.83 + 4.21$
5. $68.3 + 52.1 + 32.6 + 56.2$
6. $0.926 - 0.489$
7. $337.64 - 46.21$
8. $0.005 + 0.007 + 0.008$
9. $630.05 - 0.08$
10. $1.0001 - 0.0009$
11. $2.4831 + 2.4831$
12. $52.008 - 51.009$
13. $2.9486 - 0.7285$
14. $6.03 + 6.03 + 6.03$
15. $9.87 + 9.87 + 9.87 + 9.87$

Find the result.

16. $28\,347 + (97\,423 - 64\,999)$
17. $(28\,347 + 97\,423) - 64\,999$
18. $125 \times (684 \div 18)$
19. $(125 \times 684) \div 18$
20. $8073 - (429 + 1237)$
21. $(8073 - 429) + 1237$
22. $52\,731 \div (27 \times 31)$
23. $(52\,731 \div 27) \times 31$
24. $(90\,000 - 11\,111) - 1\,119$
25. $90\,000 - (11\,111 - 1\,119)$
26. $(7744 \div 176) \div 44$
27. $7744 \div (176 \div 44)$
28. $81\,000 \div (30 \times 30)$
29. $(196 \times 248) \div 98$
30. $7.903 - (2.845 + 5.057)$

7 MULTIPLYING AND DIVIDING DECIMALS

Multiplying Decimals and Whole Numbers

The camera store has 27 rolls of one type of film. The price of each roll is $3.15. What is the value of the 27 rolls?

Multiply 27 and 3.15.

$3.15 has the same value as 315 cents. Think of 3.15 as 315 hundredths.

For the product,

$$\begin{array}{r} 3.15 \\ \times\ 27 \\ \hline \end{array}$$

315 hundredths × 27

you need to know how to multiply 7 and 315,

$$\begin{array}{r} 3.15 \\ \times\ 27 \\ \hline 2205 \end{array}$$

315 hundredths × 27 = 2205

and how to multiply 2 and 315.

$$\begin{array}{r} 3.15 \\ \times\ 27 \\ \hline 2205 \\ 6300 \end{array}$$

315 hundredths × 27 = 2205, 6300

Then add and place the decimal point.

$$\begin{array}{r} 3.15 \\ \times\ 27 \\ \hline 2205 \\ 6300 \\ \hline 85.05 \end{array}$$

315 hundredths × 27 = 2205, 6300 = 8505 hundredths

The value of the 27 rolls of film is $85.05.

Working Together

Complete each multiplication.

1.

481	481 tenths	48.1
7	7	7
▬	▬ tenths	▬

2.

145	145 hundredths	1.45
22	22	22
▬	▬ hundredths	▬

3.

2875	2875 thousandths	2.875
35	35	35

4.

13	13 thousandths	0.013
6	6	6

Multiply.

5. 3.15 × 8 **6.** 14.3 × 79 **7.** 4.756 × 12 **8.** 0.67 × 15 **9.** 0.004 × 23 **10.** 20.3 × 375

Exercises

Multiply.

1. 57.7 × 28 **2.** 5.77 × 28 **3.** 2.695 × 9 **4.** 0.48 × 75 **5.** 375.6 × 237 **6.** \$123.45 × 67

7. 13 × 1.07 **8.** 6 × 58.6 **9.** 39 × 0.003 **10.** 10 × 20.72
11. 40 × 3.7 **12.** 76 × 0.085 **13.** 41 × 74.8 **14.** 5 × \$97.34

Solve.

15. The sports store has 7 tennis rackets in stock at \$43.75 each. What is the value of the tennis rackets?

16. The supermarket had a delivery of 144 packages of butter which were to be priced at \$1.39 each. What was the value of the butter?

When a number is multiplied by 10, each digit moves one place to the left.

Example:

	tens	ones	tenths	hundredths		tens	ones	tenths	hundredths
10 ×		3	6	7	=	3	6	7	

Multiply each number by 10. Do these in your head.
Write only the products.

17. 1.14 **18.** 28.62 **19.** 3.588 **20.** 670 **21.** 0.016 **22.** 7.5

Placing the Decimal Point

The steps for multiplying decimals are the same as the steps for multiplying whole numbers, but you have to place the decimal point in the product.

Here are two ways that help you remember where to place the decimal point in the product.

Estimate the product first, then multiply like whole numbers.

For 31×6.832,

31 rounds to 30

6.832 rounds to 7

The product will be about 210.

Count the decimal places in the factors.

For 31×6.832,

6.832 has 3 decimal places.
31 has 0 decimal places.
There will be 3 decimal places in the product.

The product of 31 and 6832 is

$$\begin{array}{r} 6\,832 \\ 31 \\ \hline 6\,832 \\ 204\,960 \\ \hline 211\,792 \end{array}$$

$$\begin{array}{r} 6.832 \\ 31 \\ \hline 6\,832 \\ 204\,960 \\ \hline 211.792 \end{array}$$

For 31×6.832, the decimal point goes here.

one
two
three

Working Together

Round and multiply to estimate each product.

How many decimal places will there be in each product?

1. $\begin{array}{r} 3.04 \\ 19 \\ \hline \end{array}$ **2.** $\begin{array}{r} 27.9 \\ 8 \\ \hline \end{array}$ **3.** $\begin{array}{r} 2.839 \\ 42 \\ \hline \end{array}$ **4.** $\begin{array}{r} 612.5 \\ 71 \\ \hline \end{array}$ **5.** $\begin{array}{r} 6.295 \\ 7 \\ \hline \end{array}$ **6.** $\begin{array}{r} 23.59 \\ 34 \\ \hline \end{array}$

Show the decimal point in each product.

7. $\begin{array}{r} 3.04 \\ 19 \\ \hline 5776 \end{array}$ **8.** $\begin{array}{r} 27.9 \\ 8 \\ \hline 2232 \end{array}$ **9.** $\begin{array}{r} 2.839 \\ 42 \\ \hline 119\,238 \end{array}$ **10.** $\begin{array}{r} 612.5 \\ 71 \\ \hline 434\,875 \end{array}$ **11.** $\begin{array}{r} 23.59 \\ 134 \\ \hline 316\,106 \end{array}$

Multiply.

12. $\begin{array}{r} 6.295 \\ 7 \\ \hline \end{array}$ **13.** $\begin{array}{r} 6.49 \\ 38 \\ \hline \end{array}$ **14.** $\begin{array}{r} 70.4 \\ 6 \\ \hline \end{array}$ **15.** $\begin{array}{r} 5.837 \\ 49 \\ \hline \end{array}$ **16.** $\begin{array}{r} 34.95 \\ 265 \\ \hline \end{array}$

Exercises

Solve.

1. A transport truck carries 9 cars, each with a mass of 806.8 kg. How heavy is the load on the truck?
2. A dentist pulled 23 teeth in a day at $22.50 per tooth. How much did the dentist charge that day for pulling teeth?

Multiply.

3. 2.9 × 83	**4.** 7.59 × 47	**5.** 57.83 × 5
6. 0.832 × 52	**7.** 64.3 × 170	**8.** $7.24 × 927

9. 32 × 3.97 **10.** 6 × 5.683
11. 561 × 16.4 **12.** 8 × 810.24
13. 100 × 1.014 **14.** 504 × $6.68

When a number is multiplied by 100, each digit moves 2 places to the left. When it is multiplied by 1000, each digit moves 3 places to the left.

Examples: 100 × 5.382 = 538.2
1000 × 5.382 = 5382

Multiply each number by 10, 100, and 1000. Write only the products.

Do these in your head.

15. 3.859 **16.** 12.674 **17.** 41.82
18. 6.27 **19.** 3.8 **20.** 0.016

Study these.

A.
$$\begin{array}{r} 40 \\ \times\ 20 \\ \hline 800 \end{array}$$

B.
$$\begin{array}{r} 800 \\ \times\ 70 \\ \hline 56000 \end{array}$$

C.
$$\begin{array}{r} 30 \\ \times\ 6000 \\ \hline 180000 \end{array}$$

Then complete each of these.

1. 4 tens × 2 tens = 8 ?
2. 8 hundreds × 7 tens = 56 ?
3. 3 tens × 6 thousands = 18 ?

For multiplying, in general,

4. tens × tens = ?
5. hundreds × tens = ?
6. tens × thousands = ?
7. hundreds × thousands = ?

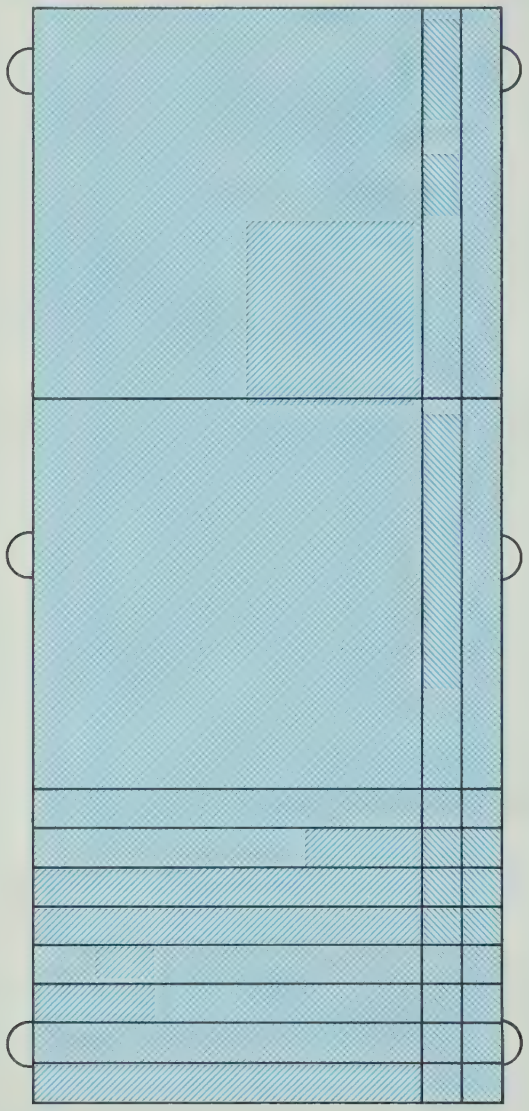
Find the product of each without using paper or pencil.

8. 30 × 30	**9.** 90 × 60
10. 400 × 80	**11.** 200 × 50
12. 8000 × 40	**13.** 6000 × 90
14. 5000 × 300	**15.** 7000 × 800
16. 300 × 200	

KEEPING SHARP

Multiplying Tenths

The top of the display table is 2.8 m long and 1.2 m wide. What is the area of the table top?



Multiply 1.2 and 2.8.

For the product

$$\begin{array}{r} 2.8 \\ \times\ 1.2 \\ \hline \end{array}$$

you need to know how to multiply 2 and 28,

$$\begin{array}{r} 2.8 \\ \times\ 1.2 \\ \hline 56 \end{array}$$

and how to multiply 1 and 28.

$$\begin{array}{r} 2.8 \\ \times\ 1.2 \\ \hline 56 \\ 28 \end{array}$$

Then add and place the decimal point.

$$\begin{array}{r} 2.8 \\ \times\ 1.2 \\ \hline 56 \\ 280 \\ \hline 3.36 \end{array}$$

Remember, you can use either of these ideas to help you place the decimal point:

2.8 rounds to 3

1.2 rounds to 1

The product will be about 3.

2.8 has 1 decimal place.
1.2 has 1 decimal place.
There will be 2 decimal places in the product.

The area of the table top is 3.36 m^2.

Working Together

Round the factors and multiply to estimate each product.

1. 9.8 × 2.4

2. 2.3 × 6.2

3. 5.7 × 32

How many decimal places are in each factor? How many will be in each product?

4. 11.2 × 4.7

5. 1.7 × 0.9

6. 7.2 × 28

Show the decimal point in each product.

7. 9.8 × 2.4 = 2352

8. 5.7 × 32 = 1824

9. 1.7 × 0.9 = 153

Multiply.

10. 2.3 × 6.2

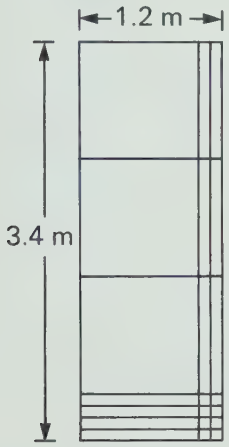
11. 7.2 × 28

12. 1.7 × 0.9

Exercises

What is the area of this table top?

1.



Multiply.

2. 3.7 × 2.9

3. 40.3 × 5.6

4. 72 × 0.6

5. 28.4 × 49

6. 4.4 × 4.8

7. 0.7 × 5.4

8. 1.3 × 7.1

9. 0.8 × 5.3

10. 66 × 3.5

11. 9.2 × 11.7

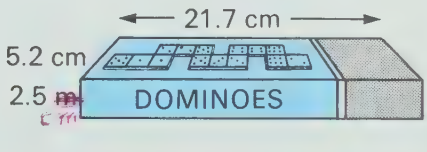
For this dominoes box, what is the area of

12. the top?

13. the front?

14. the end?

15. all the faces?



When a number is multiplied by 0.1, each digit moves one place to the right.

Example:

	tens	ones	tenths	hundredths		tens	ones	tenths	hundredths
0.1 ×	7	2	5		=		7	2	5

Multiply each number by 0.1. Write only the products.

Do these in your head.

16. 39.5

17. 15.7

18. 3.8

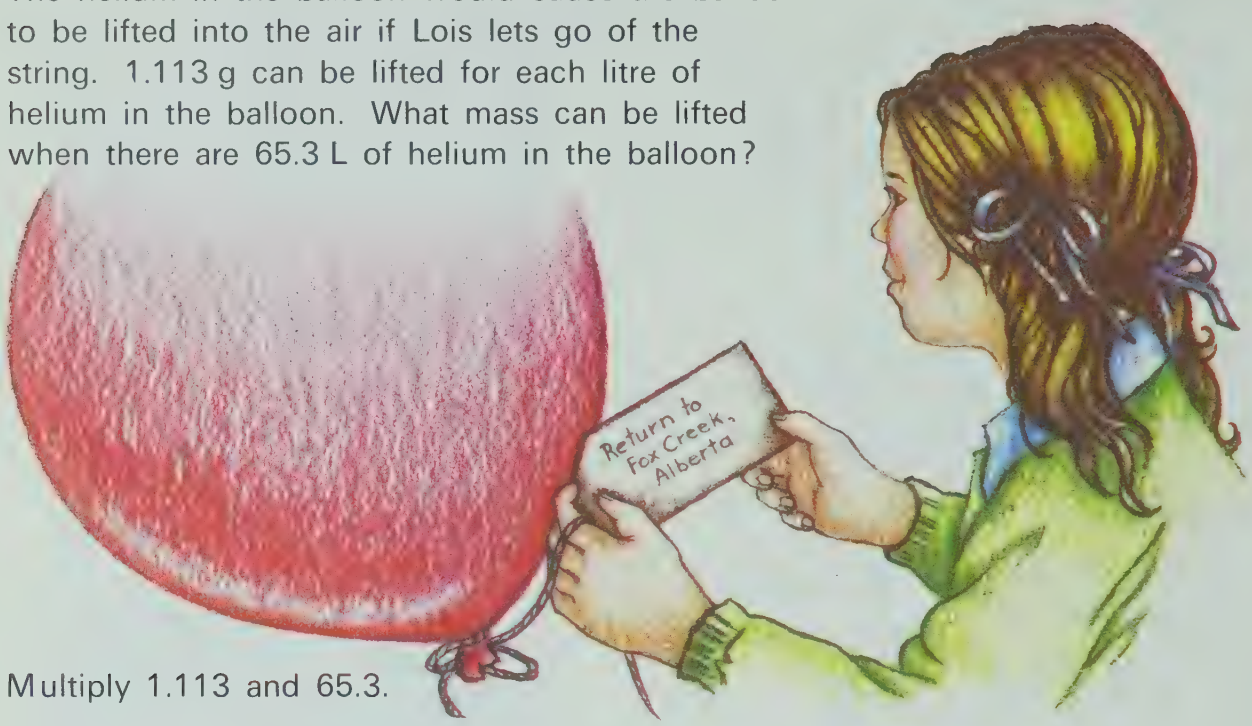
19. 75

20. 0.9

21. 510

Multiplying Hundredths and Thousandths

The helium in the balloon would cause the balloon to be lifted into the air if Lois lets go of the string. 1.113 g can be lifted for each litre of helium in the balloon. What mass can be lifted when there are 65.3 L of helium in the balloon?



Multiply 1.113 and 65.3.

Remember, you can multiply decimals like whole numbers, but then place a decimal point in the product.

For 1.113×65.3,

$65.3 \xrightarrow{\text{rounds to}} 65$

$1.113 \xrightarrow{\text{rounds to}} 1$

The product will be about 65.

For 1.113×65.3,

65.3 has 1 decimal place.

1.113 has 3 decimal places.

There will be 4 decimal places in the product.

$$\begin{array}{r} 65.3 \\ \times\ 1.113 \\ \hline 1\,959 \\ 6\,530 \\ 65\,300 \\ 653\,000 \\ \hline 72.6789 \end{array}$$

The decimal point goes here.

A mass of 72.6789 g, or about 73 g, can be lifted.

Working Together

Round the factors and multiply to estimate each product.

1. 1.786 × 9.3

2. 4.21 × 3.83

3. 3.956 × 71.6

How many decimal places are in each factor? How many will there be in each product?

4. 46.09 × 7.43

5. 2.374 × 2.6

6. 25.5 × 8.49

Show the decimal point in each product.

7. 1.78 × 9.3 = 16 554

8. 2.374 × 2.6 = 61 724

Multiply.

9. 4.21 × 3.83

10. 25.5 × 8.49

11. 7.08 × 6.4

12. 37.4 × 89.2

Exercises

Multiply.

1. 2.403 × 1.2

2. 3.14 × 3.14

3. 2.78 × 27.8

4. 6.27 × 4.5

5. 253.3 × 0.875

6. 9.51 × 8.36

7. 4.968 × 6.9

8. 61.5 × 6.7

9. 0.98 × 9.05

10. 5.88 × 4.23

11. 2.6 × 15.23

12. 5.09 × 8.62

13. 0.01 × 579.6

14. 22.9 × 0.73

15. 1.396 × 5.6

When a number is multiplied by 0.01, each digit moves 2 places to the right. When it is multiplied by 0.001, each digit moves 3 places to the right.

Examples: $0.01 \times 108.5 = 1.085$

$0.001 \times 108.5 = 0.1085$

Multiply each number by 0.1, 0.01, and 0.001. Write only the products. Do these in your head.

16. 348.7

17. 4762

18. 3.67

19. 29

20. 5.1

21. 0.7

Discuss the answers to these questions.

1. Why does the balloon being blown up become larger fast at first and larger more slowly later?

2. How far does a balloon travel when you blow it up and let it go?

3. How heavy is a balloon filled with helium?

4. How high can a balloon rise?

5. Where do balloons go that escape into the air?

PROBLEM SOLVING

Two Decimal Factors, Products Less Than 1

The cheese pizza contains 0.32 mg (milligram) of vitamin B_1.

A milligram is one-thousandth of a gram.

Nick will eat three-tenths (0.3) of the pizza. How many milligrams of vitamin B_1 will Nick get from the pizza?

Multiply 0.3 and 0.32.

For 0.3×0.32,

0.32 has 2 decimal places.
0.3 has 1 decimal place.

There will be 3 decimal places in the product.

$$\begin{array}{r} 0.32 \\ \times\ 0.3 \\ \hline 0.096 \end{array}$$

The decimal point goes here.

Nick will get 0.096 mg of vitamin B_1 from the pizza.

Working Together

How many decimal places are in each factor? How many will there be in each product?

1. 0.138 × 0.7

2. 0.18 × 0.05

3. 0.02 × 0.4

Show the decimal point in each product.

4. 0.138 × 0.7 = 966

5. 0.18 × 0.05 = 90

6. 0.02 × 0.4 = 8

Multiply.

7. 0.12 × 0.08

8. 0.79 × 0.8

9. 0.2 × 0.4

Exercises

Multiply.

1. 0.14 × 0.7

2. 0.64 × 0.32

3. 0.075 × 0.1

4. 0.794 × 0.6

5. 0.3 × 0.2

6. 0.019 × 0.3

7. 0.88 × 0.8

8. 0.02 × 0.03

9. 0.18 × 0.09

10. 0.04 × 0.2

11. 0.5 × 0.7

12. 0.27 × 0.03

13. 0.2 × 0.398

Multiply each number by 0.1, 0.01, and 0.001. Write only the products.

Do these in your head.

14. 1.7

15. 0.6

16. 53

Study these.

A. 0.4 × 0.2 = 0.08

B. 0.08 × 0.7 = 0.056

C. 0.3 × 0.006 = 0.0018

Then complete each of these.

1. 4 tenths × 2 tenths = 8 ?

2. 8 hundredths × 7 tenths = 56 ?

3. 3 tenths × 6 thousandths = 18 ?

For multiplying, in general,

4. tenths × tenths = ?

5. hundredths × tenths = ?

6. tenths × thousandths = ?

7. hundredths × thousandths = ?

Find the product of each without using paper or pencil.

8. 0.3 × 0.3

9. 0.9 × 0.6

10. 0.04 × 0.8

11. 0.02 × 0.5

12. 0.008 × 0.4

13. 0.006 × 0.9

14. 0.005 × 0.03

15. 0.007 × 0.08

try this

Practice

Science Fact:
If a volume of gas is lighter than the same volume of air, the gas rises.

Solve.

1. 1.113 g can be lifted for each litre of helium in a balloon. What mass can be lifted by 163.4 L of helium?
2. 1.203 g can be lifted for each litre of hydrogen in a balloon. What mass can be lifted by 329.7 L of hydrogen?
3. Can more be lifted with 108 L of helium, or with 100 L of hydrogen?

Science Fact:
Light rays seem to bend when they pass from water to air.

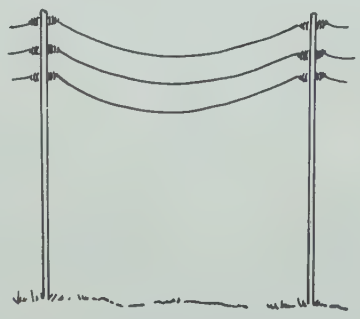
In water an object is 1.33 times deeper than it appears to be. How deep is an object that appears to be

4. 0.3 m deep?
5. 1.8 m deep?

Solve.

6. 1000 m of a steel wire will expand 0.012 m for a 1°C increase in temperature. How much will 1000 m of this wire expand for an increase of 10°C? of 0.5°C? of 19.7°C?

*7. 1 km of aluminum wire will expand 0.026 m for a 1°C increase in temperature. For a 1°C increase in temperature, what will the length become for 1.5 km of wire? for 700 m of wire?



Science Fact:
Metal expands as the temperature increases.

PROBLEM SOLVING

Each student bought a Science Fact trading card at the store. Each card cost the same amount. The total cost for the group was $2.03.

1. How many students were there?
2. How much did each Science Fact card cost?

When an amount of money and a decimal are multiplied, the product is usually rounded to the nearest cent.

Example: $1.57 × 1.25 = $1.9625 → rounds to $1.96

Multiply and round to complete these supermarket price tags.

8.

Spareribs

Price per kilogram	Total price	Net mass in kilograms
$3.70		1.64

9.

Chicken legs

Price per kilogram	Total price	Net mass in kilograms
$3.89		1.33

10.

Pork chops

Price per kilogram	Total price	Net mass in kilograms
$5.39		1.77

11.

Lamb roast

Price per kilogram	Total price	Net mass in kilograms
$2.65		2.11

You can change the order of the factors to check multiplication.

Multiply and check your work.

12. 2.15 × 49.4

13. 7.2 × 9.3

14. 89.5 × 0.64

15. 42.8 × 355

16. 0.18 × 0.27

17. 362 × 3.67

Example:

1.38	21.6
21.6	1.38
828	1 728
1 380	6 480
27 600	21 600
29.808	29.808

If these products do not match, there is a mistake.

In a Magic Square, the sums of the numbers for any row, column, or diagonal are equal.

A

1.4	4.9	4.2
6.3	3.5	0.7
2.8	2.1	5.6

B

1.1	1.2	0.7
0.6	1.0	1.4
1.3	0.8	0.9

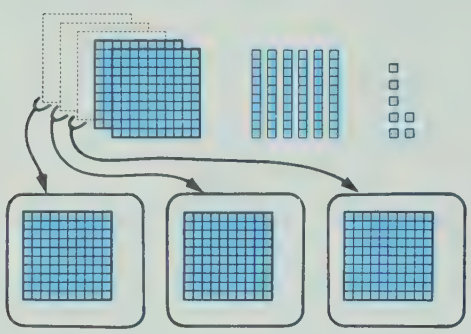
18. For Magic Square A, multiply each number by 1.06. Do the products form a Magic Square?

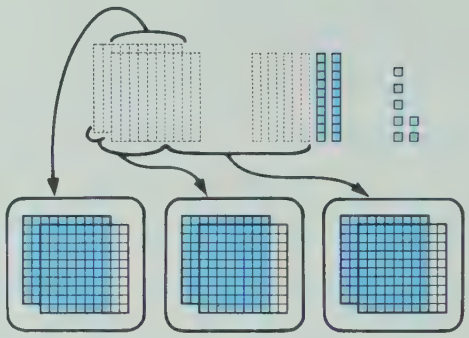
19. For Magic Square B, multiply each number by 0.27. Then add 2.859. Do the numbers that result form a Magic Square?

20. Add the two numbers in the matching positions of your two new squares. Do the numbers that result form a Magic Square?

Dividing by a One-Digit Number

Divide 5.67 by 3.





For $3\overline{)5.67}$, divide the 5 ones first.

$3 \times 1 = 3$
$3 \times 2 = 6$
. . . too great!

Use $3 \times 1 = 3$.

Write
$$\begin{array}{r} 1 \\ 3\overline{)5.67} \\ 3 \\ \hline 2 \end{array}$$

Think of the 2 ones 6 tenths that remain as 26 tenths.

$$\begin{array}{r} 1 \\ 3\overline{)5.67} \\ 3\downarrow \\ \hline 26 \end{array}$$

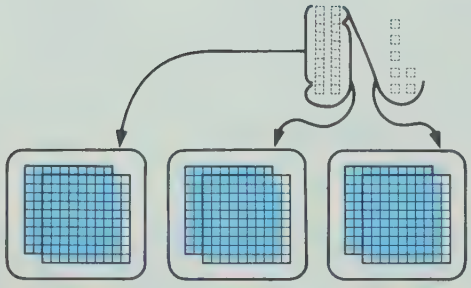
Then divide the 26 tenths.

$3 \times 8 = 24$
$3 \times 9 = 27$ . . . too great!

Use 3×8 tenths $= 24$ tenths.

Place a decimal point in the quotient.

Write
$$\begin{array}{r} 1.8 \\ 3\overline{)5.67} \\ 3 \\ \hline 26 \\ 24 \\ \hline 2 \end{array}$$



Think of the 2 tenths 7 hundredths that remain as 27 hundredths.

$$\begin{array}{r} 1.8 \\ 3\overline{)5.67} \\ 3 \\ \hline 26 \\ 24\downarrow \\ \hline 27 \end{array}$$

Then divide the 27 hundredths.

$3 \times 9 = 27$

Use 3×9 hundredths $= 27$ hundredths.

Write
$$\begin{array}{r} 1.89 \\ 3\overline{)5.67} \\ 3 \\ \hline 26 \\ 24 \\ \hline 27 \\ 27 \\ \hline 0 \end{array}$$

5.67 divided by 3 equals 1.89.

Working Together

Complete.

1. $7\overline{)0.98}$ — 0.1▮

2. $8\overline{)22.8\bigcirc}$ — 2.▮▮

3. $9\overline{)2.763}$ — 0.3▮▮

An extra zero can be used in the dividend to help divide decimals.

For this division,

4. what is the place value of each 5?

$$4\overline{)21.5\bigcirc\bigcirc}$$

5.375

20

15

12

30

28

20

20

0

Divide.

5. $5\overline{)8.75}$ **6.** $7\overline{)6.44}$ **7.** $4\overline{)16.248}$ **8.** $6\overline{)44.1}$ **9.** $8\overline{)2.44}$

Exercises

Divide.

1. $3\overline{)1.8}$ **2.** $2\overline{)9.5}$ **3.** $8\overline{)7.2}$ **4.** $6\overline{)42.48}$ **5.** $3\overline{)12.06}$

6. $7\overline{)0.77}$ **7.** $8\overline{)11.84}$ **8.** $4\overline{)0.1}$ **9.** $9\overline{)26.28}$ **10.** $5\overline{)5.1}$

11. $2\overline{)31.5}$ **12.** $6\overline{)0.48}$ **13.** $7\overline{)0.497}$ **14.** $8\overline{)3.0}$ **15.** $9\overline{)18.81}$

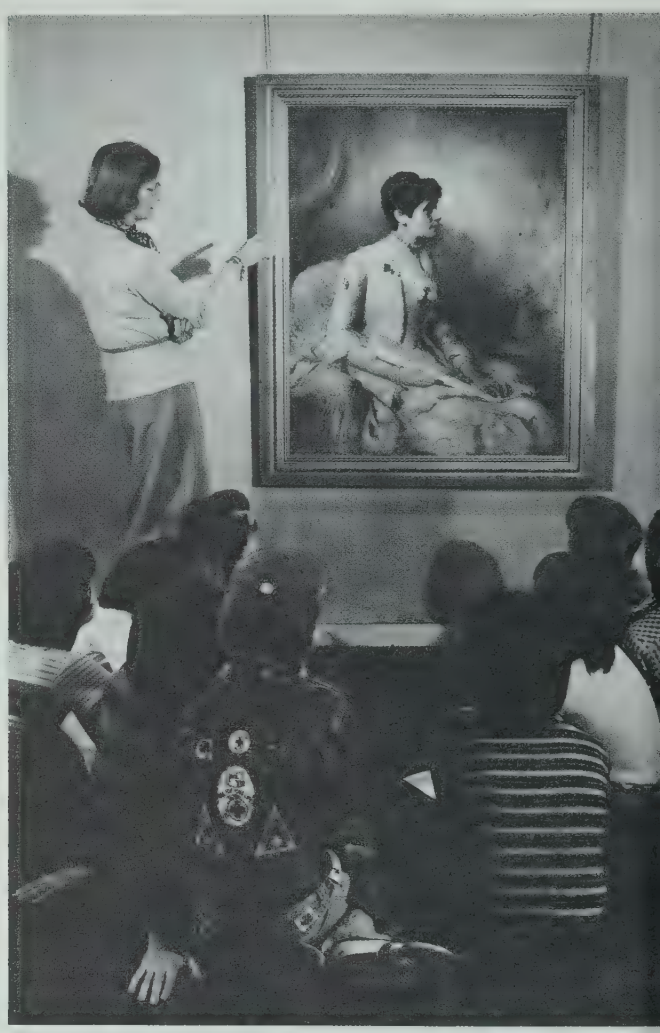
Solve.

16. What is the cost of each loaf?

17. How much syrup is in each can?

Dividing by a Two-Digit or a Three-Digit Number

Museum tickets for 31 students cost $23.25. How much did each ticket cost?



Divide 23.25 by 31.

Since 31 is greater than 23, the first digit in the quotient is 0.

Write $31\overline{)23.25}$ 0

Think of the 23 ones 2 tenths as 232 tenths.
Then divide the 232 tenths.

31 rounded to the nearest ten is 30.

Think of $30\overline{)23.25}$ 0

$30 \times 7 = 210$
$30 \times 8 = 240$ . . . too great!

Use 31 × 7 tenths = 217 tenths.

Write $31\overline{)23.25}$ 0.7

Place the decimal point.

21 7
1 5

Think of the 15 tenths 5 hundredths that remain as 155 hundredths.

$31\overline{)23.25}$ 0.7
21 7 ↓
1 5 5

Then divide the 155 hundredths. Write $31\overline{)23.25}$ 0.75

21 7
1 5 5
1 5 5
0

$30 \times 5 = 150$
$30 \times 6 = 180$
. . . too great!

Use 31 × 5 hundredths = 155 hundredths.

Each ticket cost $0.75.

Working Together

To divide decimals correctly, you should know

1. how to divide whole numbers.

$21\overline{)7854}$ $\quad 374$

2. what to do with zeros in the quotient.

$21\overline{)78.54}$ $\quad ?$

$39\overline{)24.18}$

The quotient is less than 1.

$62\overline{)252.96}$

There is a 0 here.

3. how to use extra zeros in the dividend.

$108\overline{)148.5}$

4. how to work with rounded divisors.

$79\overline{)679.4}$

Try using 80.

$43\overline{)252.41}$

Try using 40.

$285\overline{)1197.0}$

Try using 300.

Divide.

5. $58\overline{)190.24}$ **6.** $377\overline{)867.477}$ **7.** $319\overline{)242.44}$ **8.** $67\overline{)34.84}$

Exercises

Divide.

1. $41\overline{)108.24}$ **2.** $19\overline{)4.75}$ **3.** $24\overline{)49.44}$ **4.** $94\overline{)63.45}$

5. $86\overline{)262.3}$ **6.** $29\overline{)2.349}$ **7.** $36\overline{)60.444}$ **8.** $426\overline{)391.92}$

9. $371\overline{)779.1}$ **10.** $10\overline{)557.7}$ **11.** $817\overline{)849.68}$ **12.** $245\overline{)9.065}$

13. $456\overline{)1909.5}$ **14.** $517\overline{)4239.4}$ **15.** $792\overline{)11.088}$ **16.** $475\overline{)1463}$

When a number is divided by 10, each digit moves one place to the right.

Example:

tens	ones	tenths	hundredths
5	2	3	

$\div 10 =$

tens	ones	tenths	hundredths
	5	2	3

Divide each number by 10. Write only the quotients.

Do these in your head.

17. 29.3 **18.** 3.64 **19.** 275 **20.** 0.8 **21.** 75.375 **22.** 0.25

Rounding Quotients

In the passenger cabin of this airplane, 12 seats, one behind the other, take up a length of 9.75 m. What length, to the nearest hundredth of a metre, does this allow for each seat?

Divide 9.75 by 12. Round the quotient to the nearest hundredth.

To round the quotient to the second decimal place, you should divide to three decimal places.

$$
\begin{array}{r}
0.812 \\
12\overline{)9.750} \\
96 \\
\hline
15 \\
12 \\
\hline
30 \\
24 \\
\hline
6
\end{array}
$$

0.812 rounds to 0.81.

There is 0.81 m for each seat.

Working Together

Round to the

1. nearest tenth. 6.32

2. nearest hundredth. 15.827

3. nearest thousandth. 8.2785

To how many decimal places should you divide so that you can round the quotient to the

4. nearest tenth? $23\overline{)7.45}$

5. nearest hundredth? $7\overline{)18.17}$

6. nearest thousandth? $16\overline{)33.7}$

Divide. Round the quotient to the

7. nearest tenth. $23\overline{)7.45}$

8. nearest hundredth. $7\overline{)18.17}$

9. nearest thousandth. $16\overline{)33.7}$

Exercises

Divide. Round each quotient to the nearest tenth.

1. $3\overline{)21.4}$ **2.** $7\overline{)51.6}$ **3.** $8\overline{)92.9}$ **4.** $3\overline{)0.8}$ **5.** $8\overline{)0.7}$

6. $12\overline{)28.92}$ **7.** $22\overline{)60.72}$ **8.** $100\overline{)185.3}$ **9.** $212\overline{)576}$ **10.** $39\overline{)27.2}$

Divide. Round each quotient to the nearest hundredth.

11. $7\overline{)2.65}$ **12.** $8\overline{)16.38}$ **13.** $5\overline{)34.08}$ **14.** $7\overline{)62.8}$ **15.** $3\overline{)82.4}$

16. $14\overline{)91.9}$ **17.** $19\overline{)3.5}$ **18.** $82\overline{)347.6}$ **19.** $198\overline{)376}$ **20.** $534\overline{)100}$

Divide. Round each quotient to the nearest thousandth.

21. $3\overline{)12.8}$ **22.** $6\overline{)27.2}$ **23.** $9\overline{)4.25}$ **24.** $7\overline{)156.4}$ **25.** $7\overline{)0.6}$

26. $15\overline{)450.22}$ **27.** $32\overline{)16.23}$ **28.** $78\overline{)289.6}$ **29.** $124\overline{)50}$ **30.** $75\overline{)200}$

Solve.

31. On a DC-9 airplane, passengers are seated 5 abreast. The seating space is 2.29 m wide. What width, to the nearest hundredth of a metre, does this allow each passenger?

When a number is divided by 100, each digit moves 2 places to the right. When it is divided by 1000, each digit moves 3 places to the right.

Examples: $73.6 \div 100 = 0.736$

$73.6 \div 1000 = 0.0736$

Divide each number by 10, 100, and 1000. Write the quotients.

Do these in your head.

32. 4.6 **33.** 732.8 **34.** 5.8

35. 0.7 **36.** 1057 **37.** 25 000

For some divisions, you could use extra zeros in the dividend forever.

$$3\overline{)4.000\ldots} \qquad 11\overline{)32.0000\ldots}$$

When this happens, one or more of the digits in the quotient will follow a repeating pattern.

Write

$1.333\ldots = 1.\overline{3}$

$2.9090\ldots = 2.\overline{90}$

Use a bar above the repeating digits to show the quotients.

1. $6\overline{)10}$ **2.** $12\overline{)50}$

3. $18\overline{)7}$ **4.** $9\overline{)5}$

try this

Practice

When the quotient is exact, multiplication can be used to check division.

Example: $7\overline{)4.06}$ $\quad 0.58$

If the dividend and the product do not match, there is a mistake.

$$\begin{array}{r} 0.58 \\ \times\ 7 \\ \hline 4.06 \end{array}$$

Divide. Multiply to check.

1. $6\overline{)34.8}$ **2.** $7\overline{)165.34}$ **3.** $8\overline{)36.6}$ **4.** $54\overline{)36.18}$ **5.** $26\overline{)209.3}$

Solve.

6. 98 tickets were sold for $171.50. What was the price for one ticket?

7. The 48 hockey pucks have a mass of 8.16 kg. How heavy is each hockey puck?

When division is used with an amount of money and the quotient is not exact, the quotient is often rounded to the nearest cent.

Example: $5\overline{)\$1.780}$ $\quad \$0.356 \xrightarrow{\text{rounds to}} \$0.36$

Divide and round the quotient to the nearest cent.

8. $4\overline{)\$5.35}$ **9.** $7\overline{)\$53.80}$ **10.** $12\overline{)\$0.88}$ **11.** $6\overline{)\$1}$ **12.** $144\overline{)\$10}$

Solve. Give the answer to the nearest cent.

13. A dozen eggs cost $0.97. How much is this for each egg?

14. 15 apples cost $1.98. How much is this for each apple?

15. 6 L of detergent cost $5.14. How much is this for 1 L?

16. 10 kg of potatoes cost $2.39. How much is this for 1 kg?

PROBLEM SOLVING

Supermarket items are often priced at 3 for $1.00.

In the supermarket,

$3\overline{)\$1.000}$ $\quad \$0.333 \xrightarrow{\text{rounds to}} \$0.34.$

1. Why is this type of rounding used in a supermarket?

2. Find out how a calculating machine rounds the quotient $1 \div 3$.

The Decimal Point and the [·] Key on a Calculator

A calculator displays decimals positioned from the right. This means that place value is not shown by the position of a digit in the display. Instead place value is found according to the position of the decimal point.

A. Enter 456. — 4 hundreds

B. Press [÷] 10 [=] — 4 tens

C. Press [÷] 10 [=] — 4 ones

D. Press [÷] 10 [=] — 4 tenths

E. Press [÷] 10 [=] — 4 hundredths

The digits stay in the same positions.
The decimal point moves. Place values change.

In each display above, what is the place value

1. of the 5? **2.** of the 6?

What will each display show?

3. Press 2.54 [×] .

4. Then press 3.2 [×] .

5. Then press 7.65 [=] .

Start over. What will the display show after each [=] is pressed?

6. 2.45 [×] 2.5 [×] 4.8 [=] **7.** 1239 [÷] 6 [÷] 28 [=]

Calculator

Solving Problems in Two or More Steps

Which is the best buy?

For each bag, find
the cost of each kilogram.

Divide.

$$5\overline{)\$2.920}\ \$0.584 \qquad 3\overline{)\$1.750}\ \$0.583\ldots \qquad 2\overline{)\$1.18}\ \$0.59$$

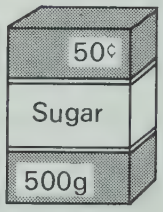
Since 0.583 is less than both 0.584 and 0.59,
the 3 kg bag is the best buy.

Which is the better or best buy,

1. 12 peaches for $2.40 or
   24 peaches for $4.40?
2. 32 m of paper towels for 77¢ or
   41 m of paper towels for 99¢?
3. 2 L of cider for 98¢,
   4 L of cider for $1.89, or
   10 L of cider for $4.75?
4. 4 kg of potatoes for 89¢,
   10 kg of potatoes for $2.10, or
   25 kg of potatoes for $4.99?
5. 50 g of nutmeg for $1.05,
   500 g of nutmeg for $9.75, or
   1000 g of nutmeg for $18.75?
6. What is the best buy for the
   nutmeg in Exercise 5 with a
   "15¢ off" coupon for any size?

Sometimes it is easier to find
how much you get at each price
for a certain amount of money.

Example:



$$50\overline{)500}\ 10$$
$$\underline{50}$$
$$00$$

You get 10 g for each cent.

Which is the better buy,

7. 500 g of salmon for $3 or
   750 g of salmon for $4?
8. 400 mL of vinegar for 34¢ or
   900 mL of vinegar for 76¢?
9. 125 serviettes for 63¢ or
   200 serviettes for 98¢?

PROBLEM SOLVING

Checking Up

Multiply.

1. 2.8 × 6

2. 4.245 × 4

3. 3.2 × 47

4. \$8.87 × 9

5. 3.86 × 19

6. 5.291 × 43

7. 57.1 × 314

8. \$0.93 × 192

9. 7.5 × 5.4

10. 9.29 × 0.7

11. 5.227 × 3.6

12. 1.69 × 9.05

13. 0.4 × 0.2

14. 1.47 × 0.4

15. 0.897 × 0.8

16. 0.25 × 0.07

Round the product to the nearest tenth.

17. 4.1 × 8.6

18. 0.64 × 5.6

19. 18.6 × 5.55

Round the product to the nearest hundredth.

20. 7.162 × 7.9

21. \$8.33 × 0.74

22. 9.672 × 19

Divide.

23. $3\overline{)14.4}$

24. $7\overline{)37.268}$

25. $26\overline{)94.9}$

26. $5\overline{)\$10.75}$

27. $66\overline{)174.24}$

28. $43\overline{)84.194}$

29. $842\overline{)6272.9}$

30. $565\overline{)\$2090.50}$

31. $56\overline{)77}$

32. $38\overline{)7.942}$

33. $45\overline{)63.27}$

34. $16\overline{)\$104}$

Round the quotient to the nearest tenth.

35. $7\overline{)36}$

36. $128\overline{)48.6}$

Round the quotient to the nearest hundredth.

37. $8\overline{)39}$

38. $26\overline{)\$4.40}$

Solve.

39. 47 L of gasoline cost \$10.81. What was the cost of each litre?

40. The average wage for each of 27 workers was \$243.17. How much did the workers earn in all?

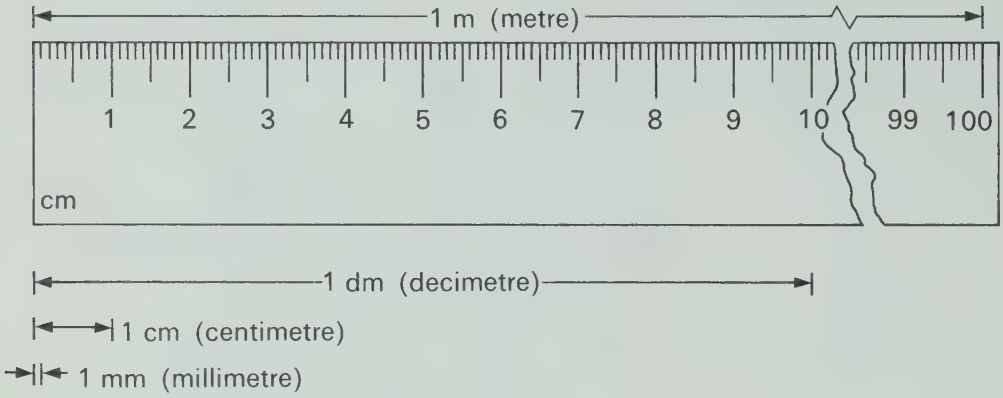
41. How many square metres are in a wall that is 4.84 m long and 3.25 m high?

42. Ed cut a rope 14.6 m long into 4 pieces that are the same length. How long is each piece?

8 MEASUREMENT

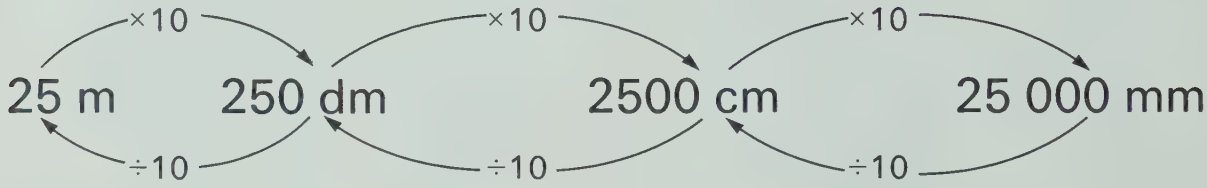
Metres, Decimetres, and Millimetres

Units of measure are related by multiples of 10.



1 m = 10 dm	1 dm = 0.1 m
1 m = 100 cm	1 cm = 0.01 m
1 m = 1000 mm	1 mm = 0.001 m

To change between units, multiply or divide by 10.



When a larger unit is changed to a smaller unit, there will be more units.

Multiply by 10, 100, or 1000.

When a smaller unit is changed to a larger unit, there will be fewer units.

Divide by 10, 100, or 1000.

When a number is multiplied by 10, 100, or 1000, the digits move one, two, or three places to the left.

$25 \times 10 = 250$

$25 \times 100 = 2500$

$25 \times 1000 = 25000$

When a number is divided by 10, 100, or 1000, the digits move one, two, or three places to the right.

$25\,000 \div 10 = 2500$

$25\,000 \div 100 = 250$

$25\,000 \div 1000 = 25$

Working Together

Multiply by 10 to complete.

1. 4 m = ▒ dm
2. 2.3 cm = ▒ mm

Divide by 10 to complete.

3. 23 dm = ▒ m
4. 48.2 cm = ▒ dm

Multiply by 10 two times, or by 100.

5. 3.6 m = ▒ cm
6. 0.9 dm = ▒ mm

Divide by 10 two times, or by 100.

7. 435 cm = ▒ m
8. 27 mm = ▒ dm

Multiply by 10 three times, or by 1000.

9. 2.5 m = ▒ mm
10. 0.75 m = ▒ mm

Divide by 10 three times, or by 1000.

11. 4000 mm = ▒ m
12. 375 mm = ▒ m

Complete.

13.

1.3 m	▒ dm	▒ cm	▒ mm

Give each length in metres.

14. 120 cm **15.** 5.7 dm **16.** 8600 mm

Give each length in centimetres.

17. 3.6 m **18.** 7000 mm **19.** 0.42 dm

Exercises

Complete.

1.	6.3 m	▒ dm	▒ cm	▒ mm
2.	▒ m	▒ dm	▒ cm	8500 mm
3.	▒ m	3.9 dm	▒ cm	▒ mm
4.	▒ m	▒ dm	2800 cm	▒ mm
5.	70 m	▒ dm	▒ cm	▒ mm
6.	▒ m	▒ dm	15 cm	▒ mm

Give each length in metres.

7. 380 cm
8. 14 dm
9. 920 mm
10. 4 cm
11. 200 mm
12. 6.8 dm

Give each length in centimetres.

13. 1.6 m **14.** 55 dm **15.** 400 mm

Give each length in millimetres.

16. 2.8 m **17.** 49 cm **18.** 0.4 dm

Which length is greater,

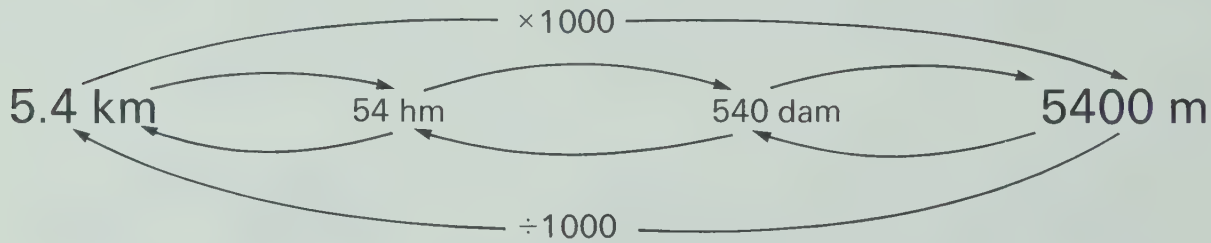
19. 500 cm or 2 m?
20. 80 dm or 0.9 m?
21. 4000 mm or 5 m?
22. 7.3 m or 800 mm?
23. 380 cm or 4 m?
24. 12 dm or 1.6 m?
25. 920 cm or 8300 mm?
26. 4.8 cm or 0.05 m?
27. 58 cm or 680 mm?

Units of Length, Kilometre to Millimetre

The names for different units of length all use "metre". The most common units are kilometre, metre, centimetre, and millimetre.

Unit	Symbol	Relation to metre
kilometre	km	1000 m
hectometre	hm	100 m
decametre	dam	10 m
metre	m	1 m
decimetre	dm	0.1 m
centimetre	cm	0.01 m
millimetre	mm	0.001 m

When a larger unit is changed to a smaller unit, there will be more units. To change kilometres to metres, multiply by 10 three times, or by 1000.



When a smaller unit is changed to a larger unit, there will be fewer units. To change metres to kilometres, divide by 10 three times, or by 1000.

Multiplying by 0.1 three times, or by 0.001, gives the same result as dividing by 1000.

When a number is divided by 10, 100, or 1000, each digit moves one, two, or three places to the right.

5400 ÷ 10 = 540

5400 ÷ 100 = 54

5400 ÷ 1000 = 5.4

When a number is multiplied by 0.1, 0.01, or 0.001, each digit moves one, two, or three places to the right.

5400 × 0.1 = 540

5400 × 0.01 = 54

5400 × 0.001 = 5.4

Working Together

Multiply by 10, 100, or 1000 to complete.

1. 7 km = ▒ hm **2.** 0.95 km = ▒ m **3.** 3.62 m = ▒ mm

Divide by 10, 100, or 1000 to complete.

4. 76 hm = ▒ km **5.** 400 m = ▒ km **6.** 270 cm = ▒ m

Multiply by 0.1, 0.01, or 0.001 to complete.

7. 76 hm = ▒ km **8.** 400 m = ▒ km **9.** 270 cm = ▒ m

Complete.

10.

2.5 km	▒ hm	▒ dam	▒ m

11.

7250 mm	▒ cm	▒ dm	▒ m

Exercises

Complete.

1. 14 000 m = ▒ km **2.** 3607 m = ▒ hm **3.** 100 m = ▒ km
4. 1.5 m = ▒ mm **5.** 0.75 m = ▒ cm **6.** 0.043 m = ▒ dm

Give each length in metres.

7. 4200 mm **8.** 0.56 km **9.** 12 dm **10.** 88 cm **11.** 15 hm
12. 160 dam **13.** 1.6 km **14.** 530 mm **15.** 6 cm **16.** 13 km

Which length is greatest,

17. 500 m, 1 km, or 0.6 dam?

18. 6.7 m, 6800 mm, or 69 cm?

Which unit of length would you use to measure each of these?

19. a marathon run

20. Moncton to Halifax

21. a mosquito

22. your height

Solve.

23. Greg estimates that he walks 2800 m each day delivering papers. About how many kilometres would he walk delivering papers for 20 d?

24. Susan made 90 ribbons for the school field day. Each ribbon is 14 cm long. How many metres of material did Susan use?

Capacity

The litre and the millilitre are the most common units for measuring **capacity**.

$1\text{ L} = 1000\text{ mL}$

$1\text{ mL} = 0.001\text{ L}$

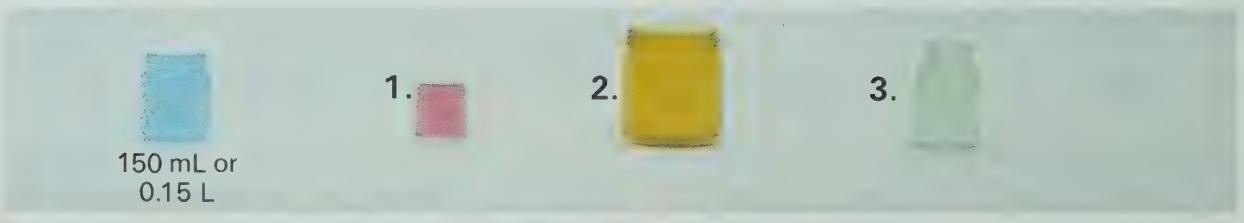
When multiplying by 1000, each digit moves three places to the left. When dividing by 1000, or multiplying by 0.001, each digit moves three places to the right.

$1.5\text{ L} = 1.5 \times 1000\text{ mL}$, or 1500 mL

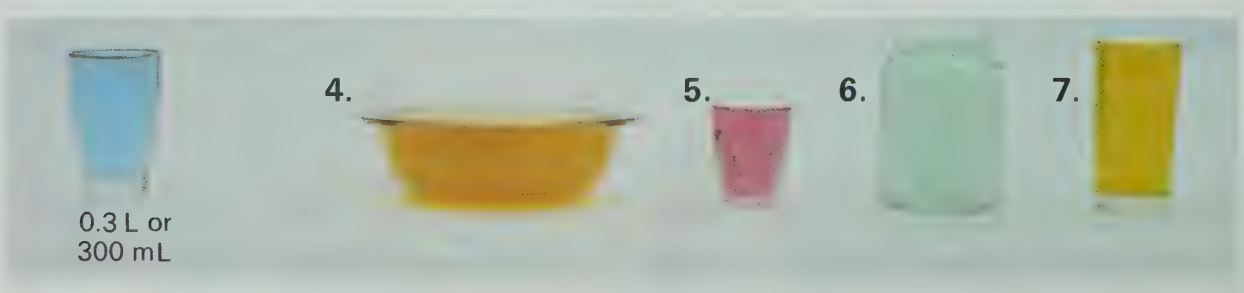
$200\text{ mL} = 200 \times 0.001\text{ L}$, or 0.2 L

Working Together

Estimate the capacity in millilitres.
Then give your estimate in litres.



Estimate the capacity in litres.
Then give your estimate in millilitres.

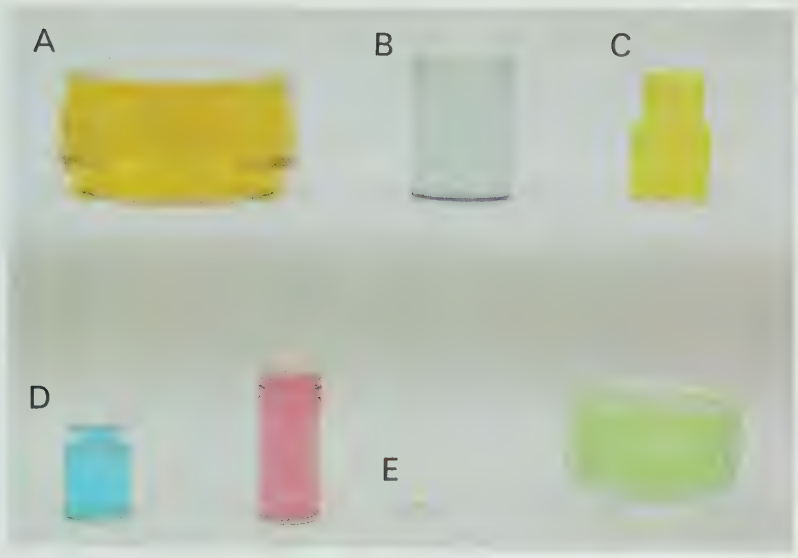


Exercises

For the objects in the picture,

1. choose the best estimate for the capacity of each.

1 mL	100 mL
500 mL	1 L
5 L	



Copy and complete the chart.

2.

Millilitres	5000	500	4	?	?	?	250	?
Litres	?	?	?	0.025	4.8	0.7	?	0.03

Which is a better unit for measuring the capacity of each of these, millilitre or litre?

3. a car gasoline tank **4.** a soup can **5.** a washing machine

Look around. Find 10 objects that could hold water.

6. Estimate the capacity of each.

If possible, measure to check your estimate.

The names for different units of capacity use "litre".

Unit	Symbol	Relation to litre
kilolitre	kL	1000 L
hectolitre	hL	100 L
decalitre	daL	10 L
litre	L	1 L

Unit	Symbol	Relation to litre
litre	L	1 L
decilitre	dL	0.1 L
centilitre	cL	0.01 L
millilitre	mL	0.001 L

What is the total capacity of a container that holds

1. 1.2 kL, 2.6 L, 4.8 daL, and 3.5 hL?

2. 17 dL, 21 cL, 40 mL, and 1 L?

try this

Mass

The kilogram and the gram are the most common units for measuring **mass**.

1 kg = 1000 g
1 g = 0.001 kg

2 kg
= 2 × 1000 g,
or 2000 g

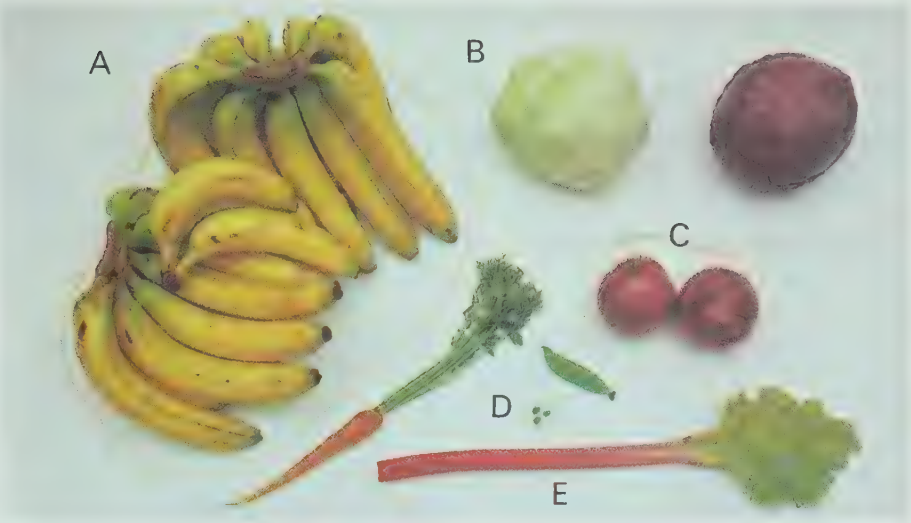
50 g
= 50 × 0.001 kg,
or 0.05 kg

Working Together

Estimate the mass in grams.
Then give your estimate in kilograms.

Estimate the mass in kilograms.
Then give your estimate in grams.

Exercises



For the objects in the picture,

1. choose the best estimate for the mass of each.

1 g	100 g
500 g	1 kg
5 kg	

Complete the chart.

2.

Grams	2000	?	500	?	8	?	?	7264	?
Kilograms	?	5	?	0.075	?	8.6	0.3	?	0.09

Give the better unit, gram or kilogram, for measuring the mass of each of these.

3. yourself **4.** a hockey puck **5.** a loaf of bread

Look around. List 10 different objects.

6. Estimate the mass of each.

If possible, measure to check your estimate.

The names for different units of mass use "gram".

Unit	Symbol	Relation to gram
kilogram	kg	1000 g
hectogram	hg	100 g
decagram	dag	10 g
gram	g	1 g

Unit	Symbol	Relation to gram
gram	g	1 g
decigram	dg	0.1 g
centigram	cg	0.01 g
milligram	mg	0.001 g

A tonne (t) is a unit used for very large masses.

1 t = 1 000 000 g = 1 000 kg

Try to think of three objects measured in

1. milligrams. **2.** tonnes.

try this

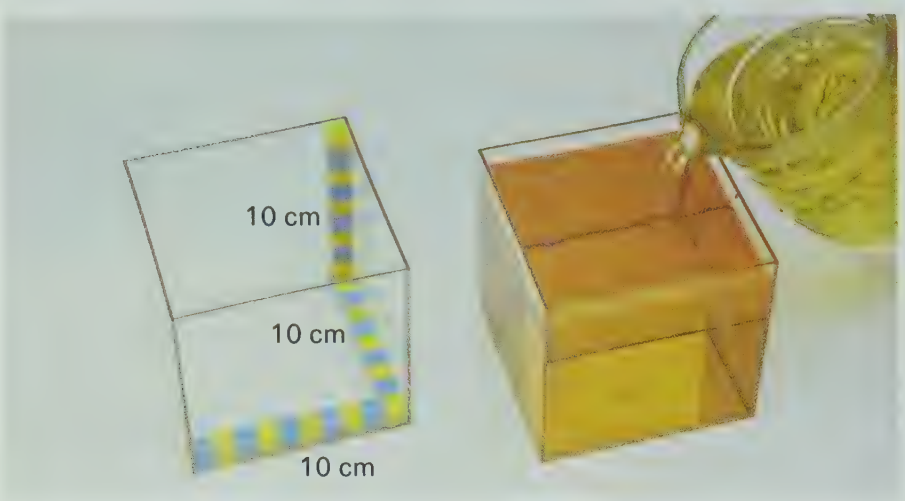
Volume and Capacity

Volume is the measure of the space taken by an object. It is given in cubic units.

This box takes 1000 cm^3, or 1 dm^3, of space.

Capacity is the measure of how much an object holds. The names for units of capacity use "litre".

1000 mL, or 1 L, will fill this box.



The space taken by 1000 cm^3, or 1 dm^3, can be filled with 1000 mL, or 1 L.

Think of a cube with 10 dm along each edge.

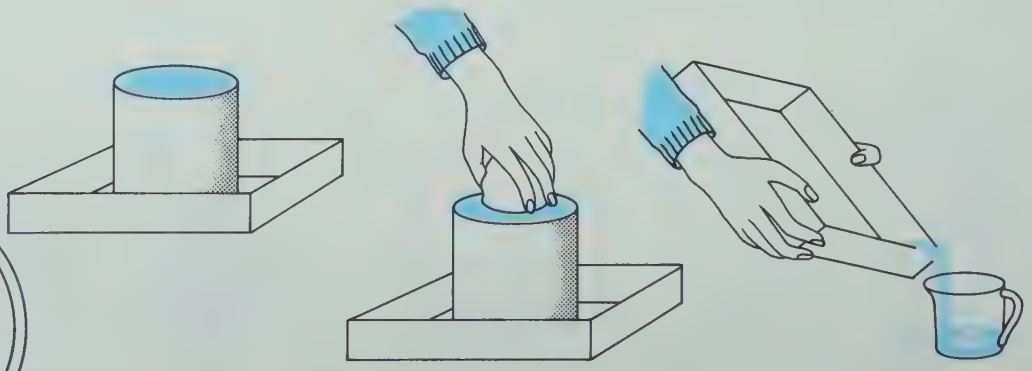
Volume	Capacity
1 cm^3 or 0.001 dm^3	1 mL or 0.001 L
1000 cm^3 or 1 dm^3	1000 mL or 1 L
1000 dm^3 or 1 m^3	1000 L or 1 kL

Here is a way to find the volume of an object, such as a rock.

1. Prepare for the experiment.

2. Place a rock in the water.

3. Measure the water that overflows.



try this

4. What will the amount of overflow show?

Working Together

How many millilitres, or litres, will fill

1. 3500 cm^3? **2.** 2 dm^3?

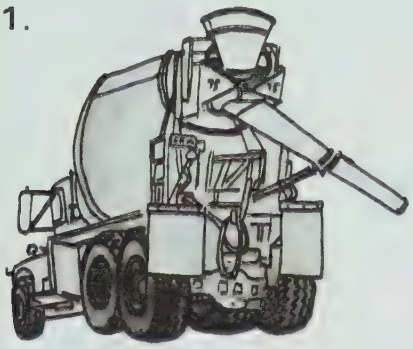
How many cubic centimetres, or cubic decimetres, are needed

3. for 1800 mL? **4.** for 7.6 L?

Exercises

Give the volume of each of these in two ways.

1.



6 kL

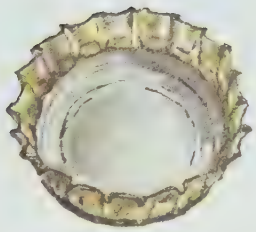
⬚ dm^3 or ⬚ m^3

2.

1.2 L

⬚ cm^3 or ⬚ dm^3

3



3 mL

⬚ cm^3 or ⬚ dm^3

Give the capacity of each of these in two ways.

4.

91 m^3

⬚ L or ⬚ kL

5.

1.5 dm^3

⬚ mL or ⬚ L

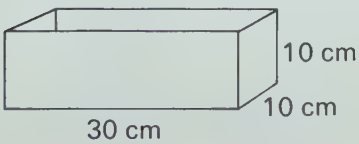
6.

100 cm^3

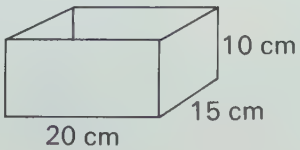
⬚ mL or ⬚ L

Give the capacity in litres for each of these.

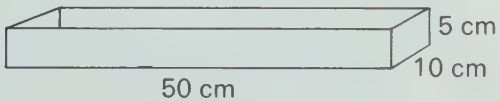
7.



8.

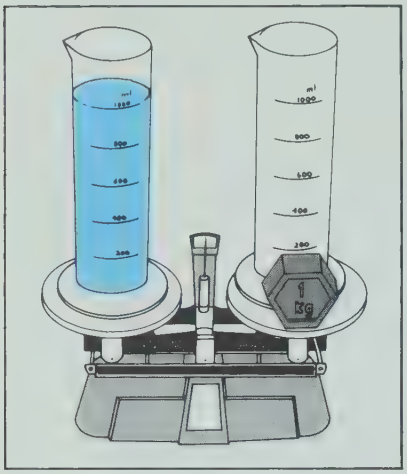


9.

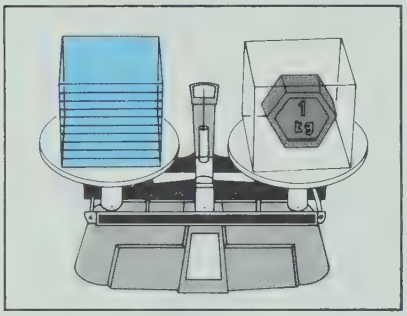


Volume, Capacity, and Mass

The mass of water is related to capacity and volume.

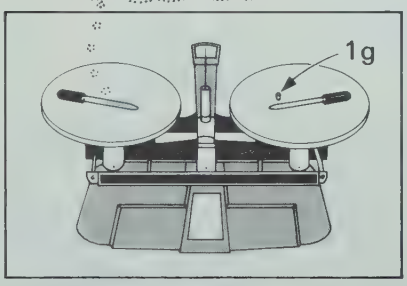


1 L of water has a mass of 1 kg.



1000 cm^3, or 1 dm^3, of water has a mass of 1 kg.

1 mL of water in the dropper



1 mL, or 1 cm^3, of water has a mass of 1 g.

Volume	Capacity	Mass (of water)
1 cm^3 or 0.001 dm^3	1 mL or 0.001 L	1 g or 0.001 kg
1000 cm^3 or 1 dm^3	1000 mL or 1 L	1000 g or 1 kg
1 000 000 cm^3 or 1000 dm^3 or 1 m^3	1 000 000 mL or 1000 L or 1 kL	1 000 000 g or 1000 kg or 1 t

Working Together

Complete.

	Volume	Capacity	Mass (of water)
1.	500 cm^3	▒▒ mL	▒▒ g
2.	▒▒ cm^3	3 mL	▒▒ g
3.	▒▒ cm^3	▒▒ mL	870 g
4.	3 dm^3	▒▒ L	▒▒ kg
5.	▒▒ dm^3	4.6 L	▒▒ kg
6.	▒▒ dm^3 or ▒▒ cm^3	▒▒ L or ▒▒ mL	0.8 kg or ▒▒ g

Exercises

Complete.

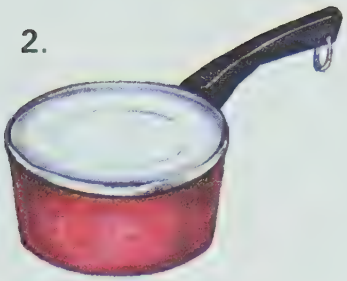
1.

350 mL

⬚ g or ⬚ kg

⬚ cm^3 or ⬚ dm^3

2.

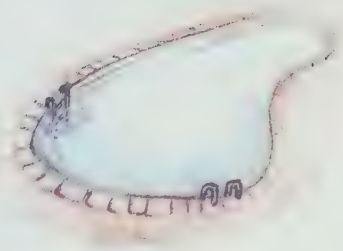


1.5 L

⬚ g or ⬚ kg

⬚ cm^3 or ⬚ dm^3

3.



86 kL

⬚ kg or ⬚ t

⬚ dm^3 or ⬚ m^3

4.

15 g

⬚ mL or ⬚ L

⬚ cm^3 or ⬚ dm^3

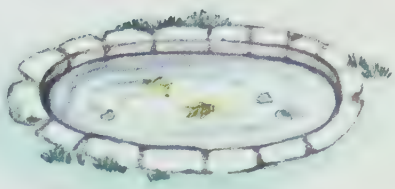
5.

3 kg

⬚ mL or ⬚ L

⬚ cm^3 or ⬚ dm^3

6.



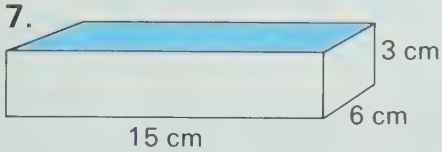
2 t

⬚ L or ⬚ kL

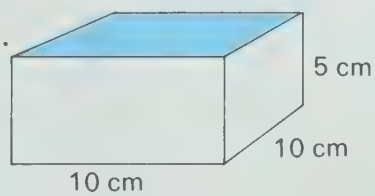
⬚ dm^3 or ⬚ m^3

Give the mass of the water in each of these containers in grams and in kilograms.

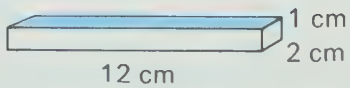
7.



8.



9.



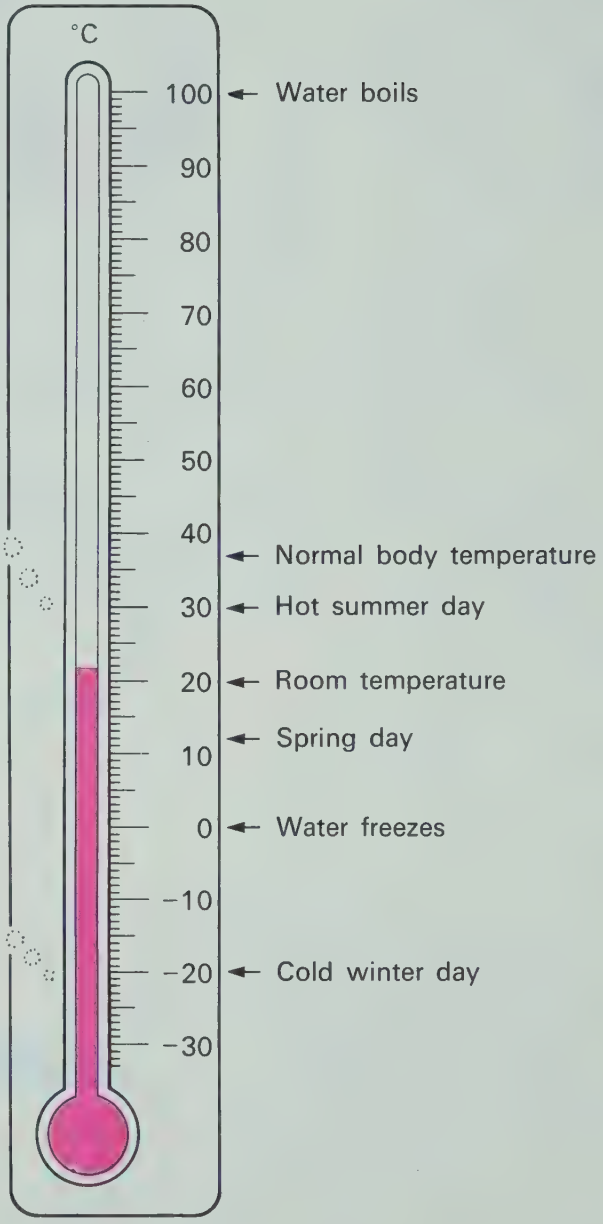
Solve.

10. The mass of a volume of milk is about 1.03 times the mass of an equal volume of water. About how heavy is 1500 mL of milk?

11. A balloon and the water inside had a mass of 375 g. The mass of the balloon was 12 g. How many millilitres of water were in the balloon?

Temperature

Match sports and other activities
with temperatures in degrees Celsius.



Working Together

Give two outdoor work activities for each temperature.

1. 0°C **2.** 10°C **3.** 20°C **4.** 30°C

Read the thermometer to give the temperature

5. for a hot summer day.

Exercises

Name two outdoor play activities for each temperature.

1. −10°C **2.** 5°C **3.** 12°C **4.** 20°C **5.** 30°C

Read the thermometer to give the temperature

6. at which water boils.

7. at which water freezes.

8. for a spring day.

9. for a normal body.

10. for room temperature.

11. for a cold winter day.

Match each place with a January temperature.

−28°C	−18°C	−4°C

12. Winnipeg, Manitoba **13.** Yellowknife, N.W.T. **14.** Windsor, Ontario

Draw a graph to show

15. Sandra's temperature during an illness.

Day	1	2	3	4	5	6	7	8
Temperature	37.0°C	37.6°C	37.9°C	38.0°C	38.2°C	37.5°C	37.2°C	37.0°C

The first Canadian television program was broadcast on September 6, 1952.

This date could be written 1952 09 06.

The first four digits show the year, the next two show the month, and the last two show the day.

Give the month, day, and year for each of these.

1. The date that the first telephone message was sent in Canada was 1876 08 10.

2. The date of the first Canadian airplane flight was 1909 02 23.

Use 8 digits to show the date for each of these.

3. On April 23, 1851, the first postage stamp in Canada was issued.

4. The first Canadian satellite was put into orbit on September 29, 1962.

5. On March 23, 1752, the first newspaper in Canada was printed.

try this

Time

This map shows the time in each time zone across Canada when it is 06:00 in Winnipeg.

Standard time is the time used for most of the year.
Daylight saving time is used during the summer in many places.

1. What is the purpose of daylight saving time?
2. Find out when daylight saving time begins and when it ends.
3. Find out what a.m. and p.m. mean.
4. Decade, century, millennium, fortnight, eon, and twinkling represent lengths of time. Find out what they mean.

PROBLEM SOLVING

Working Together

For the map on page 170, give the time in each of these cities. Show the time on a dial clock. Then show the time on a 24-hour digital clock.

1. Calgary ▒▒ : ▒▒ or ▒▒ a.m.

2. Montreal ▒▒ : ▒▒ or ▒▒ a.m.

The digital clock shows 20 s after 13:54, or 20 s after 1:54 p.m.

What would a dial clock show for each of these times?

3.

4.

Show a 24-hour digital clock

5. for 21 s after 3:45 a.m.

6. for 7 s after 9:30 p.m.

When it is 22:15:30 in Ottawa, what time is it

7. in Winnipeg?

8. in Halifax?

9. in Vancouver?

Exercises

Show the time right now to the nearest second in each of these ways.

1. ▒▒ a.m. or ▒▒ p.m.

2. on a dial clock

3. on a 24-hour clock

Draw a digital clock for the time shown on the dial clock

4. when it is morning.

5. when it is afternoon.

When a digital clock shows in Edmonton, give the time in each of these cities using a.m. or p.m. Then show a dial clock and a 24-hour digital clock for each.

6. Whitehorse

7. Regina

8. Yellowknife

9. Ottawa

10. St. John's

11. Halifax

"Hockey Night in Canada" begins at 20:00 in Montreal. At what time does it begin

12. in Calgary?

13. in Fredericton?

14. in Yellowknife?

Finding the Information Needed

Bus, railroad, and airline schedules are useful to people who travel.

SAINT JOHN – MONTREAL – WINNIPEG
REGINA – CALGARY – BANFF – VANCOUVER

Travelling west: read down. Travelling east: Read up.

Kilometres	Example	Time		Daily		Time	Example	Time Zone
0	Thurs.	20:50	Dp	Saint John, N.B.	Ar	09:45	Fri.	Atlantic
	Fri.	08:35	Ar	Montreal	Dp	20:05	Thurs.	Eastern
763	↓	11:27	Dp		Ar	19:50	↑	"
778		11:33		Dorval, Que.		19:40		"
938		13:35		Ottawa, Ont.		17:55		"
		21:15	Ar	Sudbury	Dp	10:00		"
1463		22:25	Dp		Ar	09:20	Thurs.	"
2351	Fri.	12:55		Thunder Bay, Ont.		19:10	Wed.	Eastern
	Sat.	20:15	Ar	Winnipeg, Man.	Dp	09:20	↑	Central
3025	↓	20:45	Dp		Ar	08:45		"
3600	Sun.	03:55		Regina, Sask.		01:45	Wed.	Central
		12:20	Ar	Calgary, Alta.	Dp	15:35	Tues.	Mountain
4365	↓	12:55	Dp		Ar	15:00	↑	"
4497	Sun.	15:10		Banff, Alta.		13:00	Tues.	Mountain
5596	Mon.	08:25	Ar	Vancouver, B.C.	Dp	17:45	Mon.	Pacific

This schedule shows the time it takes to travel across Canada by train.

1. For travelling from Saint John, do you catch the train in the morning or in the evening?
2. How long does it take to go from Saint John to Montreal?
3. How long does it take to go from Regina to Calgary?
4. How long does it take to go from Calgary to Regina?

Look in the last column of the schedule for a clue.

5. Is there much difference in your answers for Exercises 3 and 4? If so, why? Does your reason suggest a change in your answer for these exercises and for Exercise 2?
6. If you leave Thunder Bay on the train going west, where will you be 26 h later?

PROBLEM SOLVING

Checking Up

Choose the best unit, millimetre, centimetre, metre, or kilometre, for measuring each of these.

1. the edge of a page

2. the height of a house

Choose the better unit, millilitre or litre, for measuring the capacity of each of these.

3. a drinking straw

4. a cereal bowl

Choose the better unit, gram or kilogram, for measuring the mass of each of these.

5. a concrete block

6. a wristwatch

Complete.

7. 4 m = ▒ cm

8. 75 mm = ▒ cm

9. 130 cm = ▒ m

10. 8625 mm = ▒ m

11. 12.3 cm = ▒ mm

12. 11 111 m = ▒ km

13. 500 mL = ▒ L

14. 1375 cm^3 = ▒ mL

15. 6 L = ▒ mL

16. 750 mL = ▒ cm^3

17. 15 000 cm^3 = ▒ L

18. 2.5 L = ▒ cm^3

19. 2 kg = ▒ g

20. 2700 g = ▒ kg

21. 0.25 kg = ▒ g

Which is greater,

22. 26.1 cm or 2.62 m?

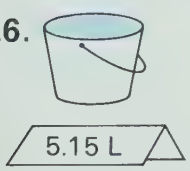
23. 7 km or 750 m?

24. 0.075 L or 705 mL?

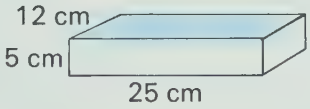
25. 1060.3 g or 1.063 kg?

How heavy is the water?

26.



27.

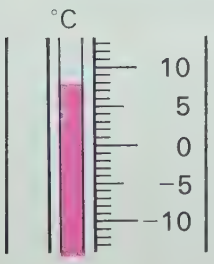


How much water is there?

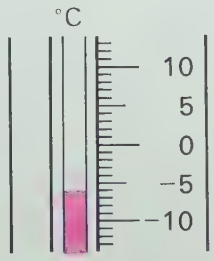
28.	675 g	▒ mL	▒ cm^3
29.	3.5 kg	▒ mL	▒ m^3
30.	4250 g	▒ L	▒ cm^3

Give the temperature.

31.



32.



Write the time shown on the clock

33. when it is time for lunch.

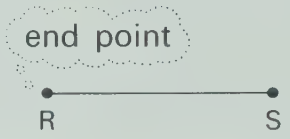
9 GEOMETRY

Lines, Line Segments, and Rays

A **line** is straight. It continues without end in two directions.

Say line PQ or line QP.
Write $\overleftrightarrow{PQ}$ or $\overleftrightarrow{QP}$.

A **line segment** is part of a line. It has two **end points**.

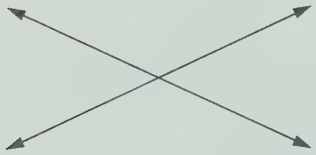


Say line segment RS or line segment SR.
Write $\overline{RS}$ or $\overline{SR}$.

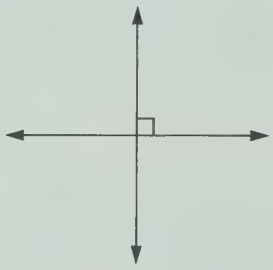
A **ray** is part of a line. It has one end point and continues without end in one direction.

Say ray TU.
Write $\overrightarrow{TU}$.

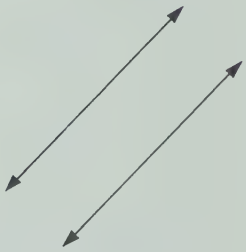
Two lines that meet are **intersecting lines**. The point where they meet is their **intersection**.



Two lines or parts of a line that meet and form a square corner are **perpendicular lines**.



These two lines never meet. They are **parallel lines**.



Working Together

Complete.

1.	A B	?	?
2.	?	line segment CD or line segment DC	?
3.	?	?	$\overrightarrow{EF}$

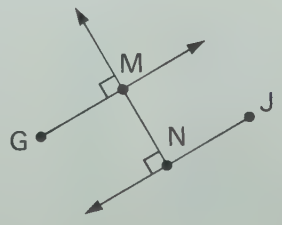
Draw and label

6. a pair of intersecting lines.

For the rays shown,

4. name two that are parallel.

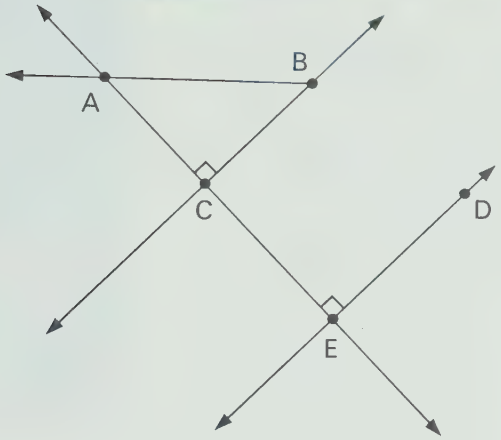
5. name two that are perpendicular.



OUR LADY OF FATIMA SCHOOL
9825 [illegible] STREET
EDMONTON, [illegible] ALBERTA

Exercises

For this picture,



1. name two lines.
2. name five line segments.
3. name three rays.
4. name two parallel lines.
5. name two perpendicular lines.
6. name a line segment and a ray that intersect.

Draw and label each of these.

7. $\overleftrightarrow{XY}$
8. $\overline{EF}$
9. $\overrightarrow{JK}$
10. two intersecting line segments
11. ray CD parallel to line HR
12. $\overrightarrow{CD}$ perpendicular to $\overline{CR}$

In this picture, the shore line suggests a line. The rungs on the railing suggest line segments. The corners of the door frame suggest perpendicular line segments. The yellow beams from the lighthouse suggest rays.

Look around.
Name two things that suggest each of these.

13. a ray
14. a line
15. a line segment
16. intersecting line segments
17. perpendicular line segments
18. parallel line segments
19. a ray intersecting with a line segment

Angles

Two rays that have the same end point form an **angle**.

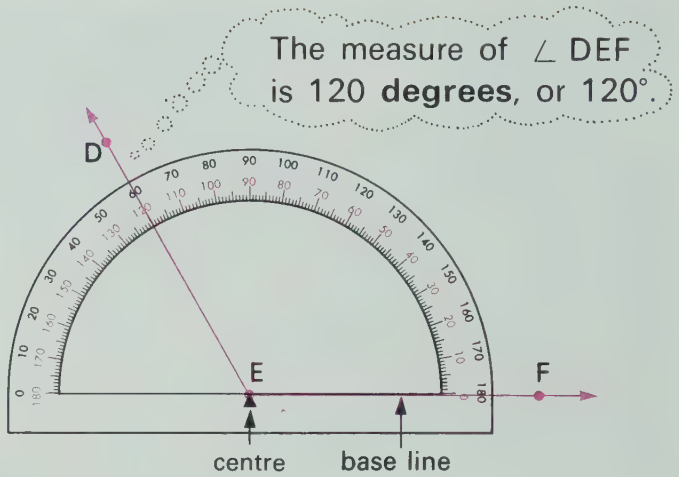
For the angle suggested in the picture, you could say angle JKL or angle LKJ. You could write ∠ JKL or ∠ LKJ.

The common end point is the **vertex** of the angle.

K is the vertex of the angle in the picture.

Working Together

To measure an angle, place the centre of a **protractor** on the vertex of the angle. Line up the base line of the protractor with one ray of the angle. Start at 0 on the base line. Read the number of degrees shown at the other ray.



An angle greater than 0° but less than 90° is an **acute angle**.

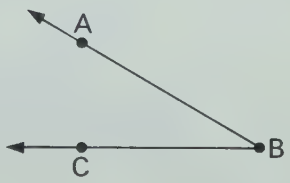
An angle of 90° is a **right angle**.

An angle greater than 90° but less than 180° is an **obtuse angle**.

An angle of 180° is a **straight angle**.

Name each angle. Measure the angle. Tell whether it is acute, right, obtuse, or straight.

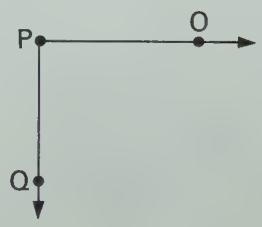
1.



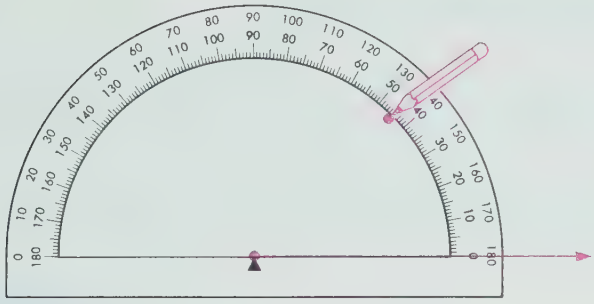
2.

3.

4.

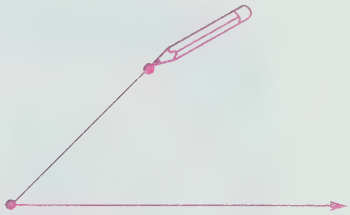


To draw an angle of a certain measurement, such as 45°, first draw a ray. Place the centre of a protractor on the end point of the ray. Line up the base line of the protractor with the ray. Mark a dot at 45°. Draw a ray from the end point through the dot.



Use a protractor and draw an angle for each measurement.

5. 30° **6.** 107°

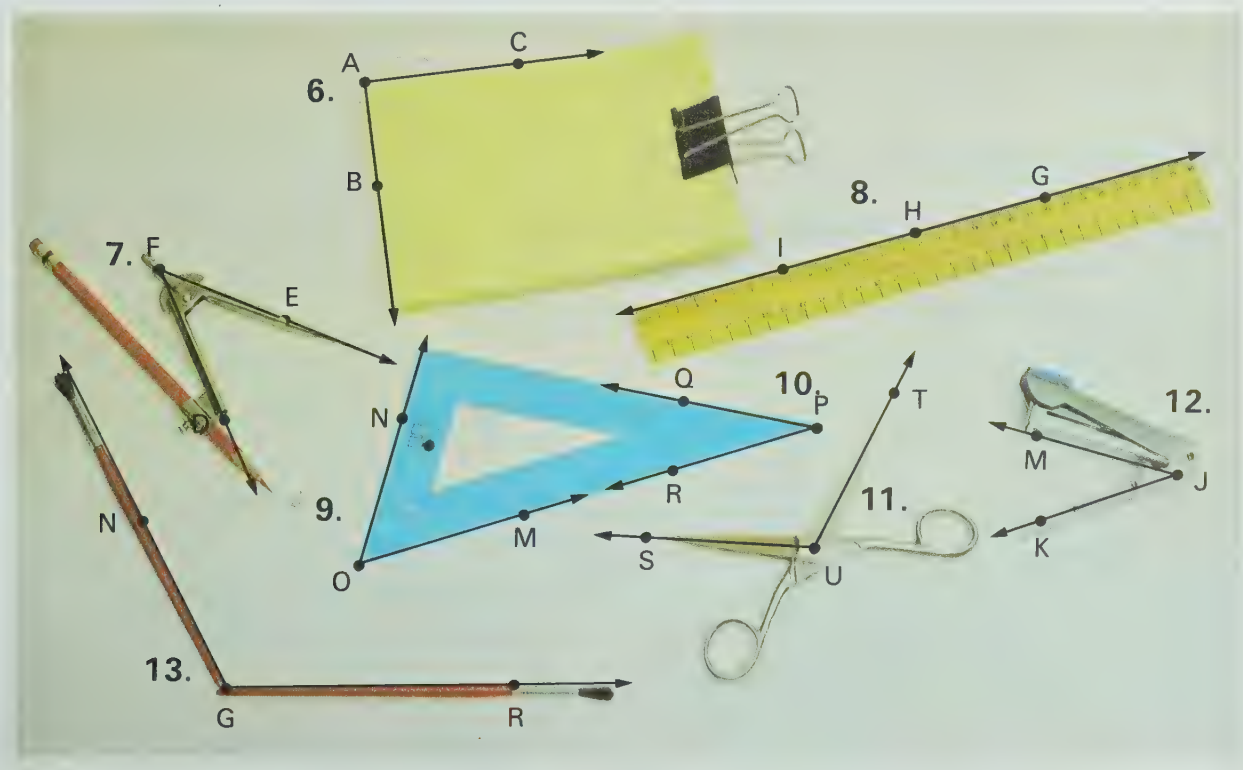


Exercises

Use a protractor and draw an angle for each measurement.

1. 10° **2.** 95° **3.** 180° **4.** 86° **5.** 162°

Name each angle in two ways. Write its measurement. Tell whether it is acute, right, obtuse, or straight.



Line Symmetry

A picture has **line symmetry** if it can be folded in half so that one part matches the other part.

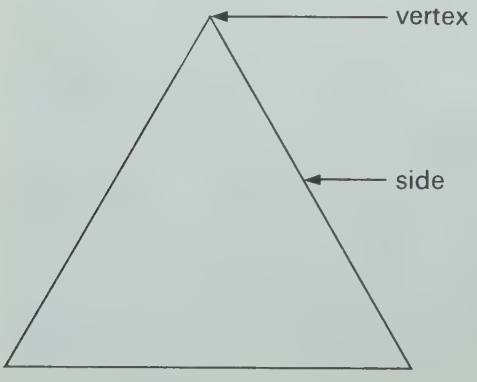
A line that separates the picture into two matching parts is a **line of symmetry**.

This picture has line symmetry.

Find points on one side of the line of symmetry for this picture that match points on the other side of the line of symmetry.

Working Together

Check for line symmetry. First trace the shape. Then fold the tracing in half. If the two halves can be made to match, the shape has line symmetry. The fold shows a line of symmetry.



1. Check this triangle for line symmetry.
2. How many lines of symmetry can you find?
3. Show the lines of symmetry in your tracing.
4. Give the number of vertices.
5. Give the number of sides.

Exercises

Complete this chart.

	Kinds of polygons	Number of vertices	Number of sides	Number of lines of symmetry
1.	Square	?	?	?
2.	Rectangle	?	?	?
3.	Rhombus	?	?	?
4.	Parallelogram	?	?	?
5.	Trapezoid	?	?	?
6.	Regular pentagon	?	?	?
7.	Regular hexagon	?	?	?
8.	Regular octagon	?	?	?
9.	Regular decagon	?	?	?

Trace the polygons for Exercises 1 to 9.

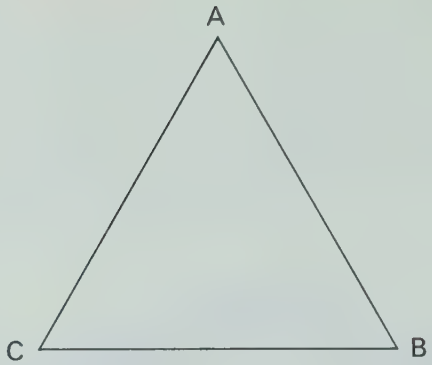
Look around. Find objects with line symmetry.

10. Show the lines of symmetry.

11. Give ten examples.

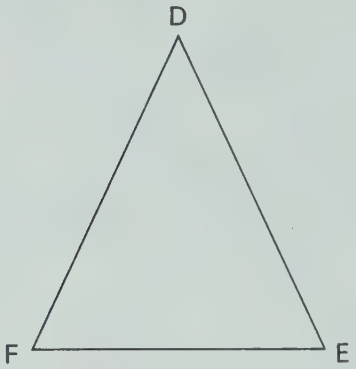
Triangles

A triangle with three sides of equal length is an **equilateral triangle**.



Triangles are polygons.

A triangle with two sides of equal length is an **isosceles triangle**.



A triangle can be named using its three vertices. Two names for this triangle are △DEF and △EFD.

What are its other names?

A triangle with all sides of different length is a **scalene triangle**.

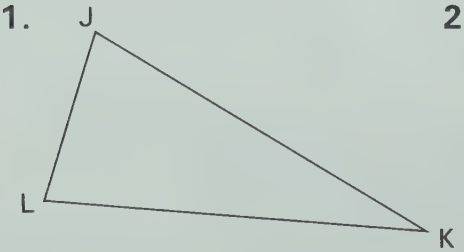
The angles of this triangle are ∠GIH, ∠IHG, and ∠HGI.

Exercises

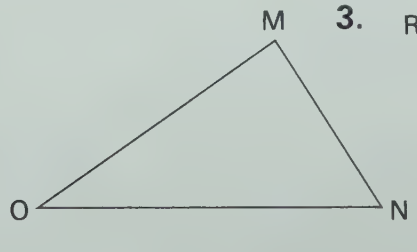
Name each triangle. Tell whether it is equilateral, isosceles, or scalene.

You can measure the sides to find out.

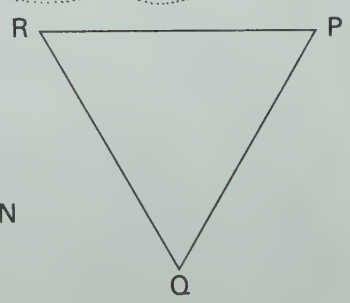
1.



2.

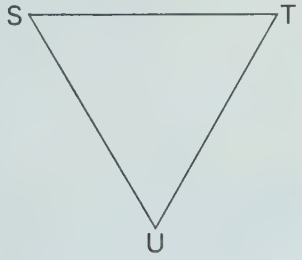


3.

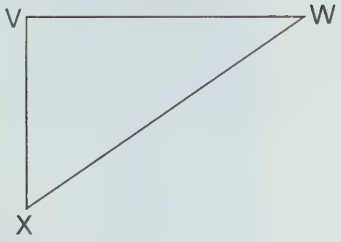


Tell whether each triangle is equilateral, isosceles, or scalene. Measure the angles.

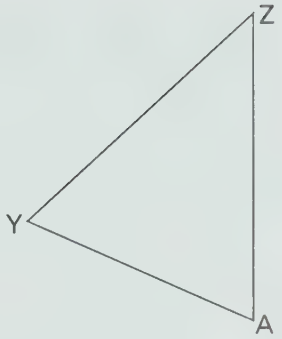
4.



5.



6.



Complete this chart for the nine triangles on pages 180 and 181.

7.

Name of triangle	Kind of triangle	Number of sides of equal length	Number of lines of symmetry	Angle measurements
△ ABC	equilateral	3	3	60°, 60°, 60°

For this chart, what do you notice about

8. the number of sides of equal length for each kind of triangle?

9. the number of lines of symmetry for each kind of triangle?

10. the angle measurements of equilateral triangles?

11. the sum of the angle measurements for each triangle?

Multiply.

1. $\begin{array}{r} 916 \\ \times\ 10 \\ \hline \end{array}$ **2.** $\begin{array}{r} 570 \\ \times\ 90 \\ \hline \end{array}$ **3.** $\begin{array}{r} 814 \\ \times\ 73 \\ \hline \end{array}$ **4.** $\begin{array}{r} 963 \\ \times\ 100 \\ \hline \end{array}$ **5.** $\begin{array}{r} 185 \\ \times\ 932 \\ \hline \end{array}$ **6.** $\begin{array}{r} 967 \\ \times\ 610 \\ \hline \end{array}$

Divide. Give the quotient and remainder.

7. $8\overline{)51\,984}$ **8.** $10\overline{)12\,170}$ **9.** $70\overline{)45\,458}$ **10.** $31\overline{)19\,496}$

11. $75\overline{)22\,935}$ **12.** $100\overline{)48\,008}$ **13.** $589\overline{)64\,364}$ **14.** $421\overline{)16\,739}$

Multiply or divide. Write only the results.

15. 9732 × 100 **16.** 644 000 ÷ 10 **17.** 1000 × 6514

18. 814 000 ÷ 100 **19.** 473 000 ÷ 1000 **20.** 10 × 8407

21. 60 300 ÷ 10 **22.** 100 × 2010

KEEPING SHARP

Circles

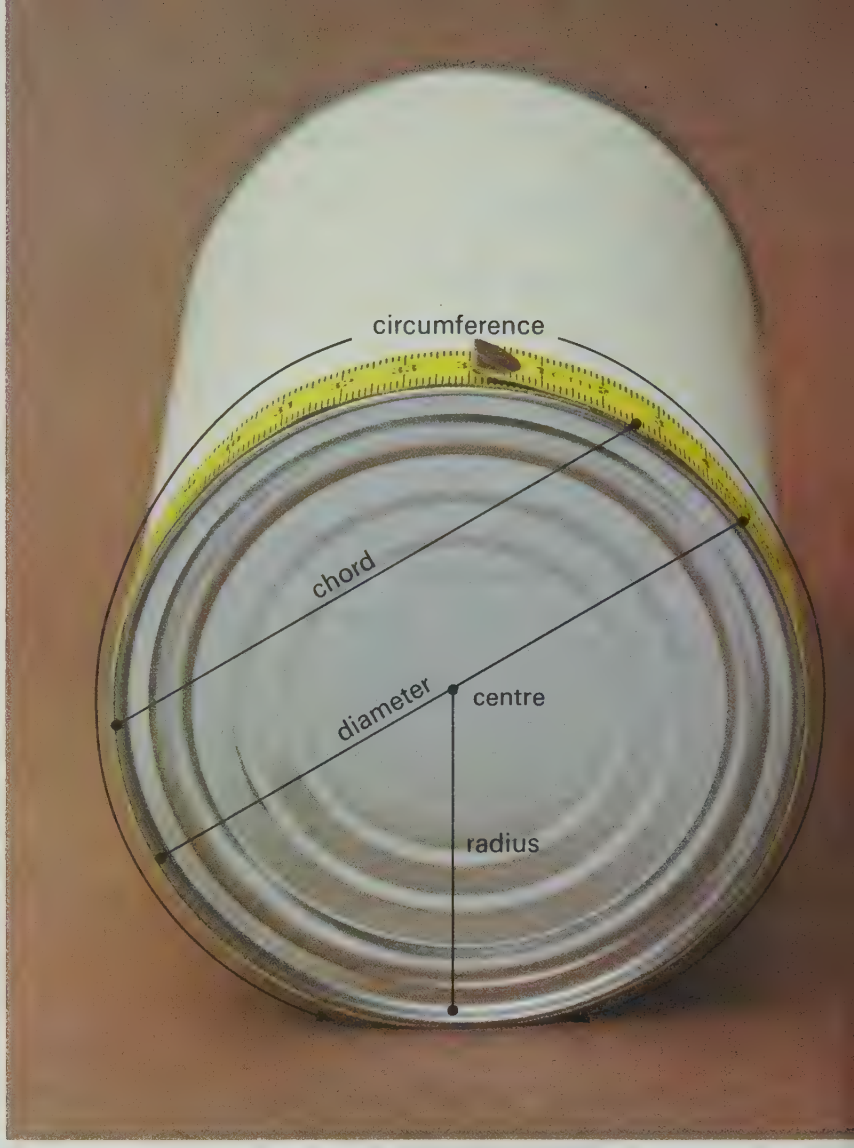
The points in a circle are all the same distance from one point called the **centre** of the circle.

A **radius** of a circle is a line segment with one end point at the centre of the circle and the other end point on the circle.

A **diameter** of a circle is a line segment having both end points on the circle and containing the centre.

A **chord** of a circle is a line segment with both end points on the circle.

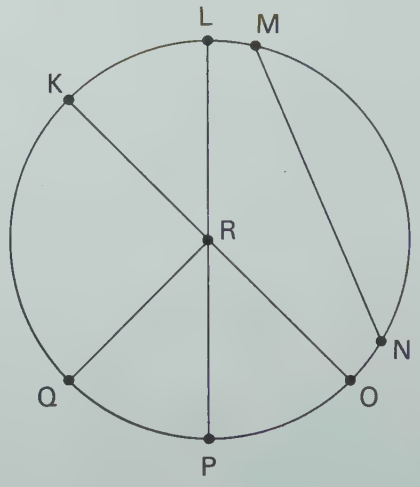
The distance around a circle is the **circumference**. The circumference of this can is about 34 cm.



Exercises

For this circle,

1. name the centre.
2. name two diameters.
3. measure each diameter.
4. name each radius.
5. measure each radius.
6. name three chords.
7. name two lines of symmetry.
*__8.__ give the number of lines of symmetry that are possible for a circle.



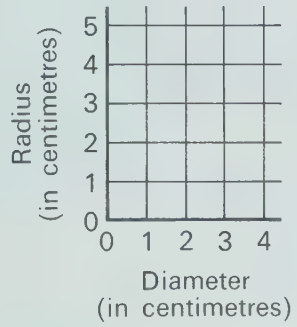
Look around. Make a chart like this for six different objects.

9.

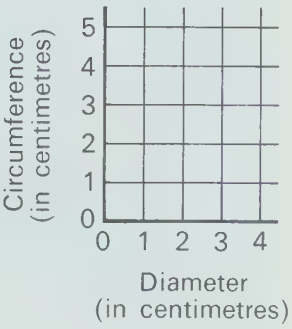
Examples of circles	Radius measurement	Diameter measurement	Circumference measurement
the lid of a can	4 cm	8 cm	25.1 cm

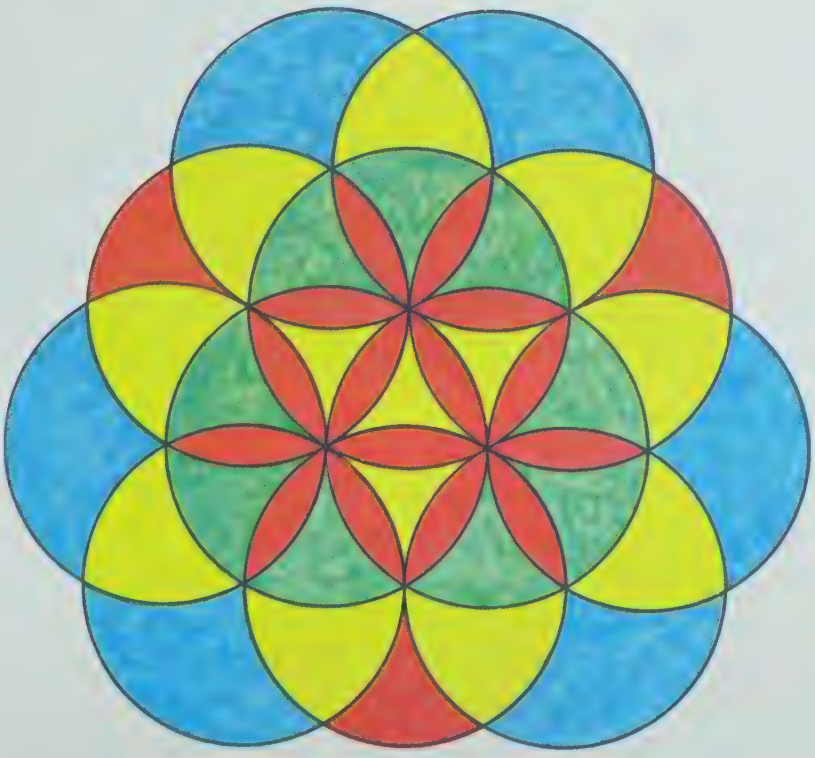
Use the information in the chart and complete these line graphs to show

10. the radius measurements and the diameter measurements.



11. the diameter measurements and the circumference measurements.





Make a design

1. using compasses.
2. using compasses and a ruler.

try this

Congruent Shapes

Margaret Ann made two **congruent** shapes on a geoboard.

Objects that are congruent have the same shape and the same size.

Working Together

Check for congruent shapes by first tracing one of the shapes. Then place the tracing over the other shape. If the tracing can be made to fit exactly, the shapes are congruent.

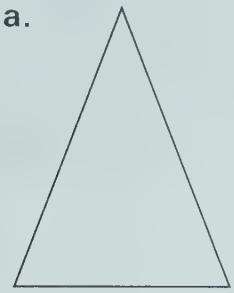
Are these triangles congruent?

1.

Exercises

Use tracing paper and find two congruent triangles.

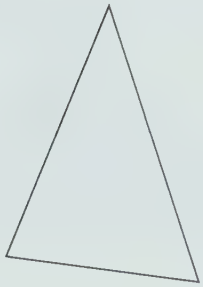
1. a.



b.

c.

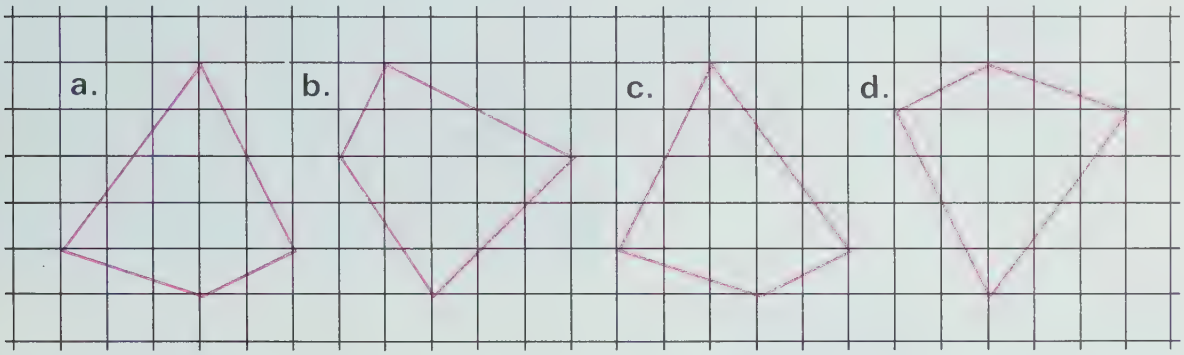
d.



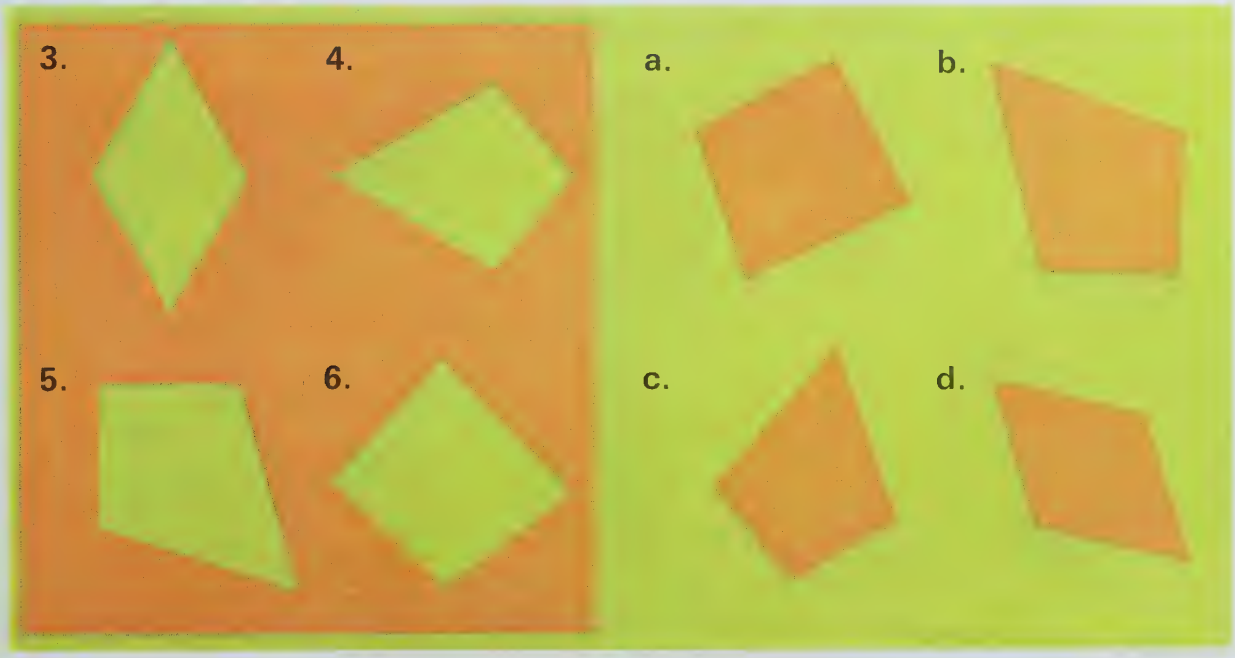
Find two congruent quadrilaterals.

A quadrilateral is a polygon with four sides.

2.



Use tracing paper to find out which puzzle piece fits in each space in the puzzle.



Similar Shapes

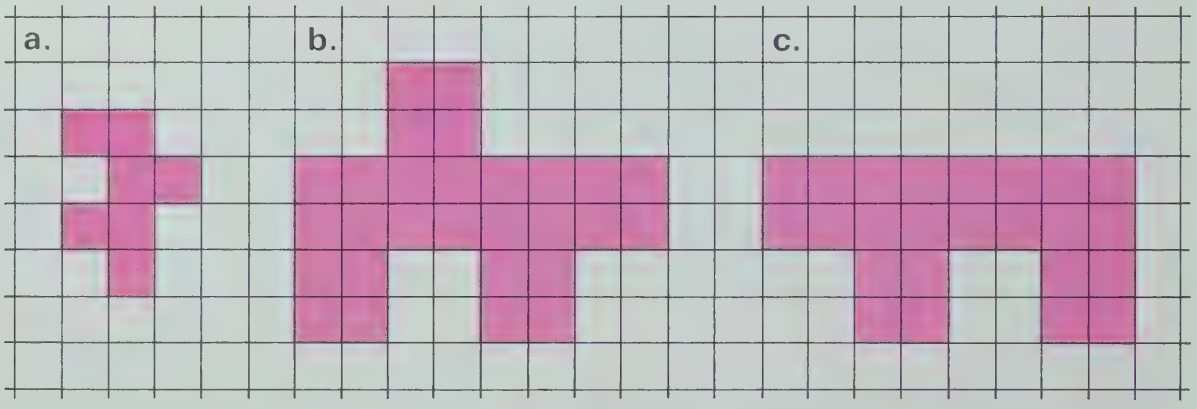
Todd's face in this picture and the face on the T-shirt are **similar**.

Similar objects have the same shape, but they are not always the same size.

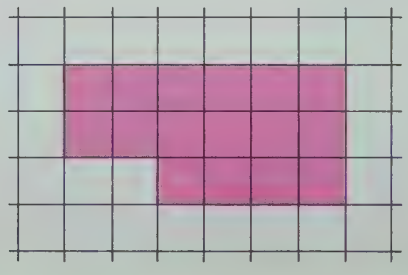
Working Together

Which two shapes are similar?

1. a. b. c.



Copy this shape on grid paper.

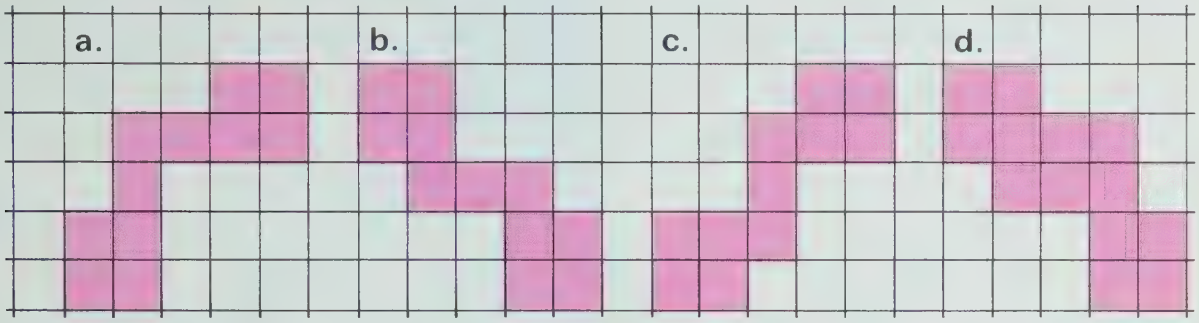


2. On the grid paper, draw a similar shape with each side two times as long.

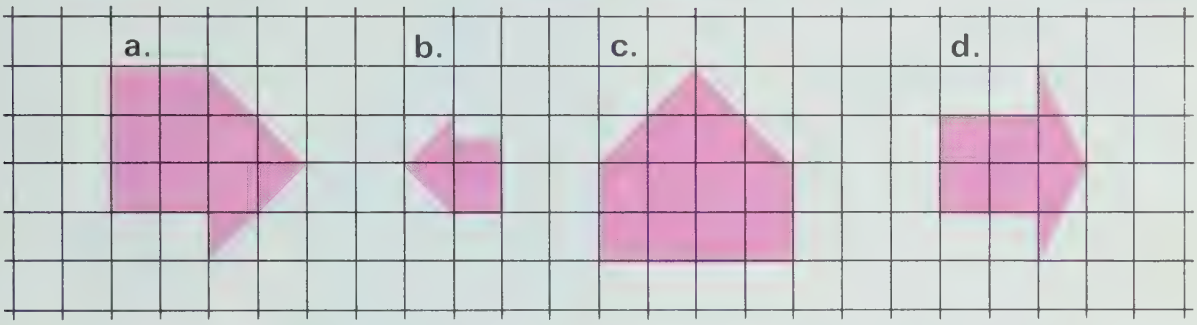
Exercises

For each of these, which two shapes are similar?

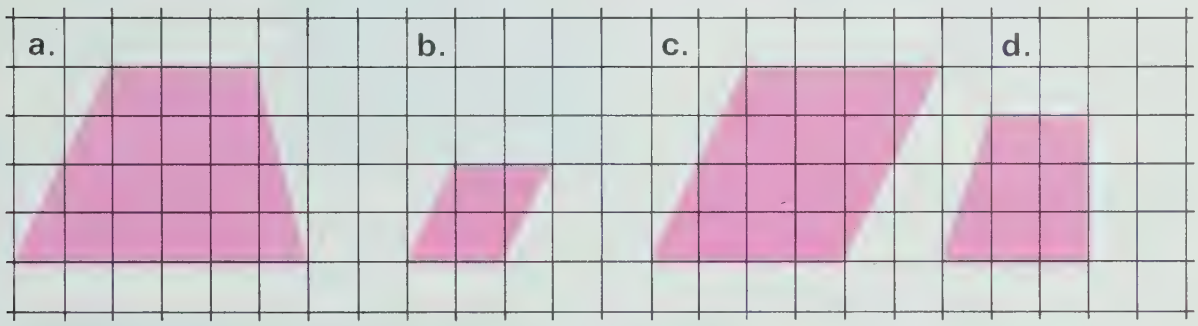
1. a. b. c. d.



2. a. b. c. d.

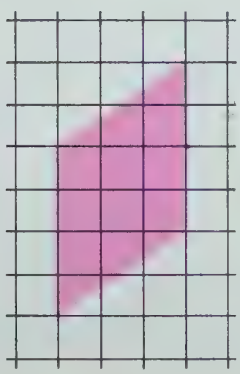


3. a. b. c. d.

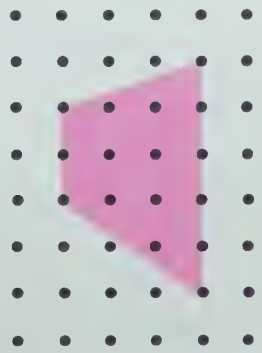


Copy each of these shapes. Then draw a similar shape with each side

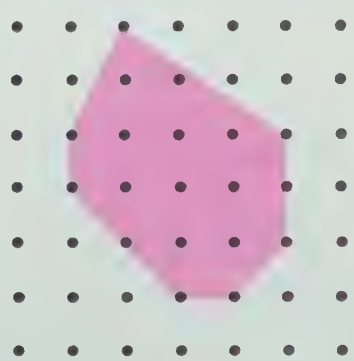
4. two times as long.



5. four times as long.



6. three times as long.



Scale Drawings

What is the real distance between Vancouver and Rock Bay?

On the map, Vancouver and Rock Bay are 3.3 cm apart.

The scale for the map shows that each centimetre on the map represents 60 km.

Multiply to find the real distance.

3.3 × 60, or 198 km

the number of centimetres on the map times the number of kilometres represented by each centimetre

The real distance between Vancouver and Rock Bay is 198 km.

Working Together

Use the map.

1. On the map, what is the distance in centimetres from Seaford to Nanaimo?
2. What numbers should be multiplied to find the real distance from Seaford to Nanaimo?
3. What is the real distance from Seaford to Nanaimo?

Follow these steps to make a scale drawing of your classroom.

4. Measure its length and width.
5. Choose a scale, such as 1 cm to 2 m.
6. Make the scale drawing.

For the scale 1 cm to 2 m, each centimetre length you draw represents 2 m of real length.

7. In your drawing, show the chalkboard.

Exercises

Use the map to find the real distance for each of these.

1. Nootka to Powell River
2. Port Hardy to Port Alberni
3. Bella Coola to Duncan
4. Victoria to Seaford
5. Campbell River to Port Hardy
6. Powell River to Kleena Kleene

Complete.

	Scale on a map	Distance on the map	Real distance	Places on the map
7.	1 cm to 20 km	12.75 cm	..... km	Jasper to Banff
8.	1 cm to 50 km	16.3 cm	..... km	Montreal to Charlottetown
9.	1 cm to 10 km	28.5 cm	..... km	Edmonton to Calgary
10.	1 cm to 100 km	..... cm	380 km	Niagara Falls to Ottawa
11.	1 cm to 50 km	..... cm	715 km	Saskatoon to Winnipeg

Use a scale different from the one on page 188.

12. Make another scale drawing of your classroom. Include scale drawings of the classroom furniture.

Show your scale.

In this picture, each car suggests a **point**.
The fields suggest a **plane**.
A turn in a road suggests a **curve**.

A plane is a flat surface.

Look around.
Find five objects that suggest each of these.

1. a point
2. a plane
3. a curve
4. a line

try this

Multiply.

1. 87.6 × 30	**2.** 1.71 × 2.9	**3.** 36.8 × 4.62
4. 516 × 4.1	**5.** 0.61 × 0.1	**6.** 5.8 × 5.67
7. 0.82 × 0.2	**8.** 800 × 8.51	**9.** 4.52 × 10
10. 0.93 × 0.01	**11.** 0.24 × 0.34	**12.** 0.87 × 0.1

Divide. Use extra zeros if needed.

13. $9\overline{)83.844}$	**14.** $54\overline{)3258.9}$
15. $685\overline{)265.78}$	**16.** $80\overline{)724}$
17. $32\overline{)25.824}$	**18.** $230\overline{)19.228}$
19. $100\overline{)158}$	**20.** $90\overline{)67.59}$
21. $6\overline{)2883}$	**22.** $941\overline{)7151.6}$
23. $12\overline{)106.08}$	**24.** $475\overline{)35.815}$
25. $10\overline{)4800.9}$	**26.** $600\overline{)294}$

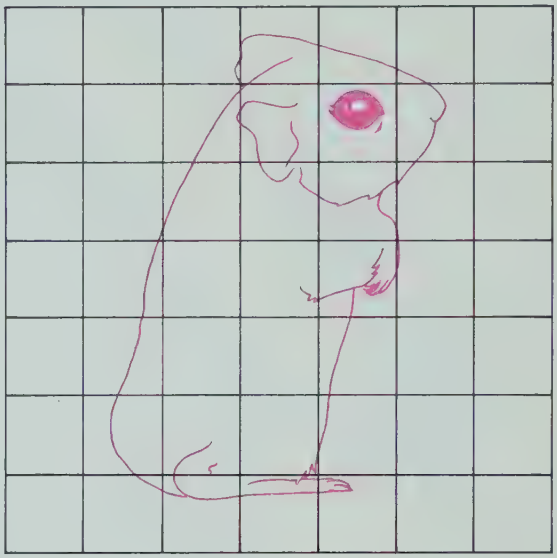
Do these in your head.

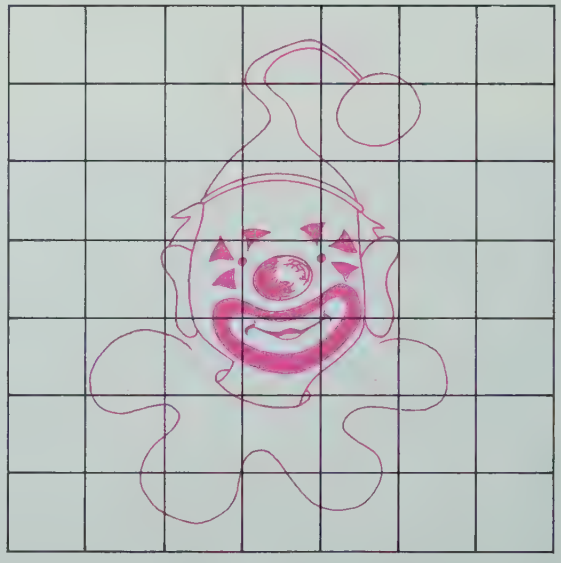
27. 0.1 × 9641	**28.** 29.4 ÷ 100
29. 8348 ÷ 10	**30.** 100 × 1.26
31. 4.37 × 10	**32.** 203 × 0.01
	33. 20 ÷ 1000
	34. 0.001 × 77
	35. 595 ÷ 100
	36. 0.01 × 400
	37. 146 ÷ 10

KEEPING SHARP

Copying Pictures Using Grids

Each of these pictures is drawn on a grid that uses squares.

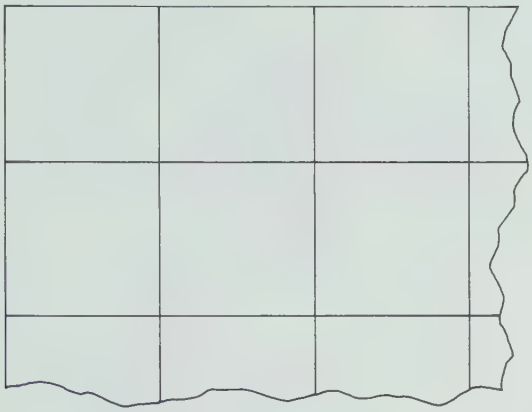




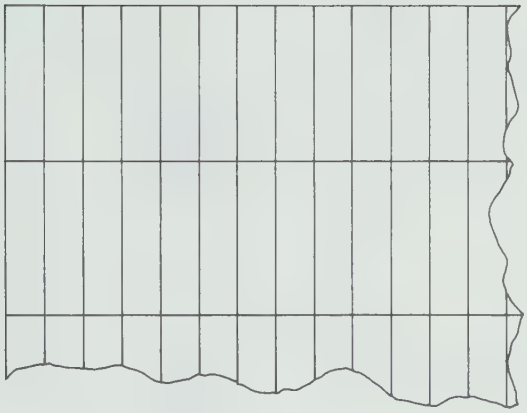
Exercises

Copy a picture from page 190 on grids that look like these.

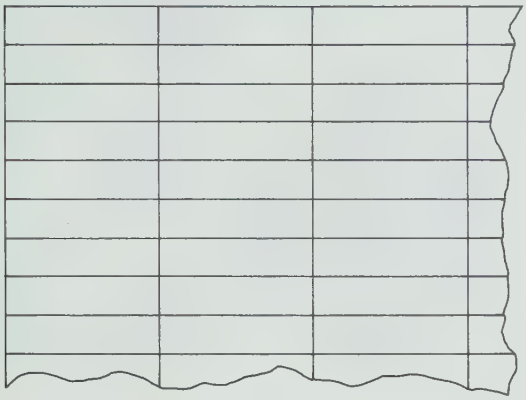
1.



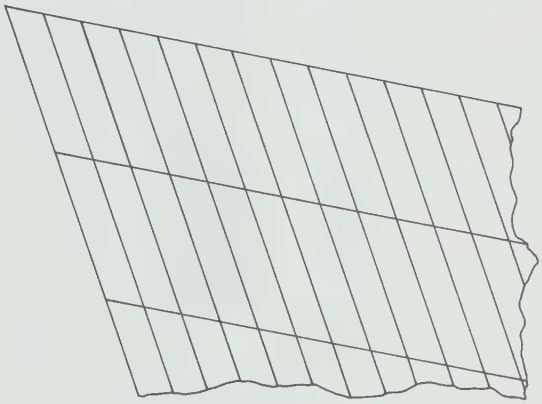
2.



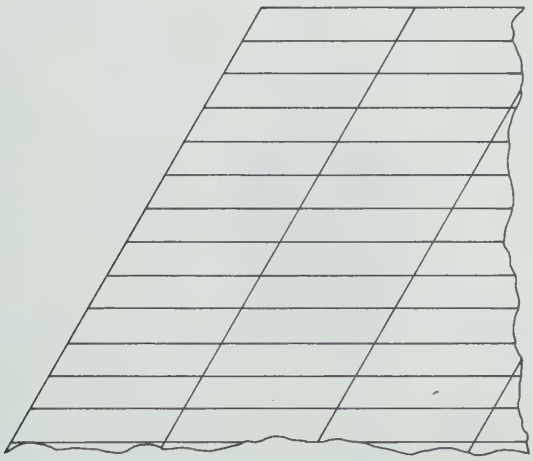
3.



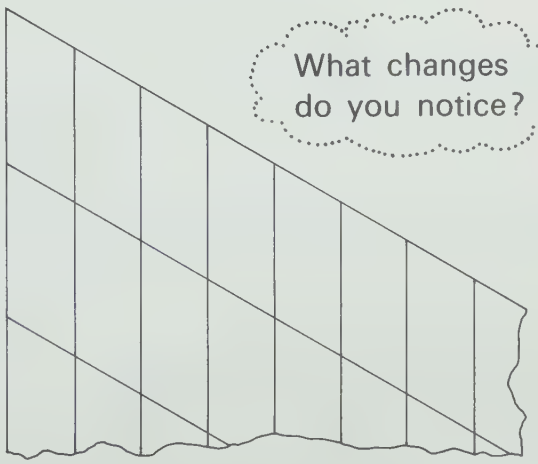
4.



5.



6.



7. Use a straight edge and draw a grid. Copy a picture from page 190 on your grid.

8. Draw a picture on a grid that uses squares. Copy your picture on grids that look like the ones on this page.

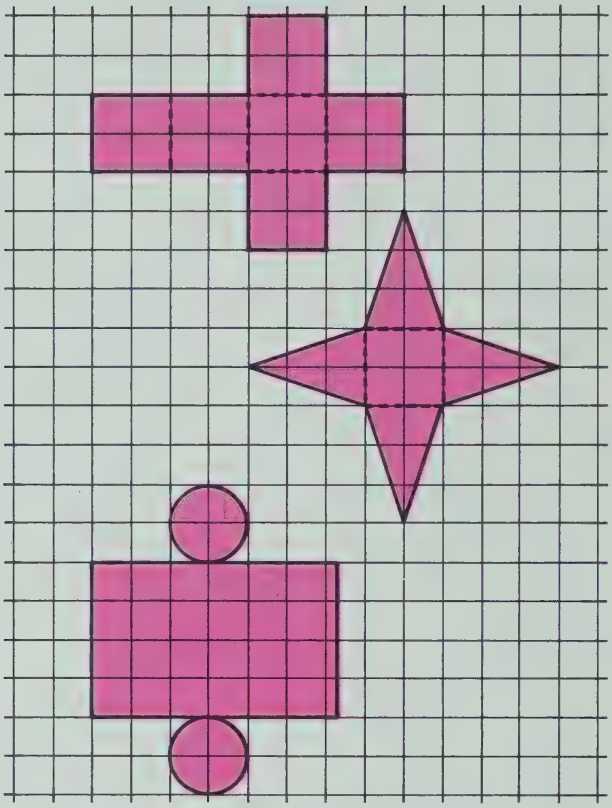
Solid Shapes

A solid shape can be made
by folding a pattern for the shape.

Cube

Square pyramid

Cylinder



Working Together

To draw a pattern for the pentagonal prism,

1. how many faces would you draw?
2. what shape would each face have?

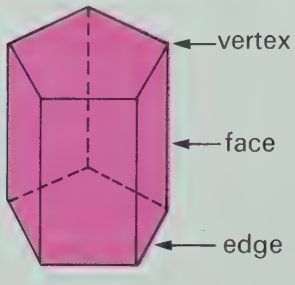
For a pentagonal prism,

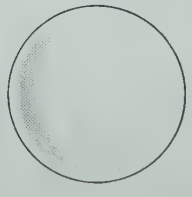
3. give the number of edges.
4. give the number of vertices.

Match these objects with
the solids they suggest.

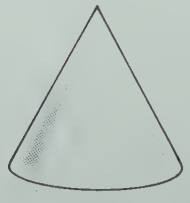
5. an ice cream cone
6. a balloon

Pentagonal prism





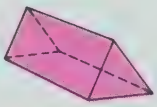
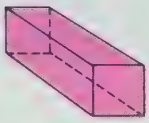
a. a sphere



b. a cone

Exercises

Complete.

	Kinds of solids	Number of vertices	Number of edges	Number of faces	Number and shapes of the faces
1.	 Triangular prism	?	?	?	2 triangles 3 rectangles
2.	Triangular pyramid (tetrahedron)	?	?	?	?
3.	 Rectangular prism (cuboid)	?	?	?	?
4.	Hexagonal prism	?	?	?	?
5.	Octagonal pyramid	?	?	?	?

For each pattern on page 192,

6. enlarge the pattern and make a solid shape.

Draw a pattern for each of these.
Then make the solid shape.

7. a rectangular prism **8.** a triangular pyramid **9.** a cone

Which solid is suggested by each of these?

10. a spruce tree **11.** a baseball **12.** a juice can

Look around. Make a chart like this.

13.

Examples of solids	Kind of solid suggested
a can of paint	cylinder

Writing and Solving Equations

Ann and her family sold hats at the fair. They had 62 hats. After selling for 3 h, they had 48 hats left. How many hats did they sell?

This equation tells the story.

$62 - n = 48$

This related equation helps complete the solution.

$62 - 48 = n$

$62 - 48 = 14$

They sold 14 hats.

Here are examples of related number sentences.

Addition and Subtraction		Multiplication and Division	
$14 + 48 = 62$	$48 + 14 = 62$	$8 \times 9 = 72$	$9 \times 8 = 72$
$62 - 48 = 14$	$62 - 14 = 48$	$72 \div 8 = 9$	$72 \div 9 = 8$

Copy each equation. Write a related equation. Then find the solution.

1. $n - 10 = 78$
2. $6 \times n = 42$
3. $n \div 11 = 9$
4. $31 \times n = 620$
5. $n + 15 = 73$
6. $n - 25 = 100$
7. $n \div 10 = 76$
8. $n \times 90 = 900$
9. $21 + n = 53$

Write an equation for each of these. Then write a related equation. Find the solution.

10. Each hat sold for \$3. On the first day, Ann's family collected \$66. How many hats did they sell on the first day?

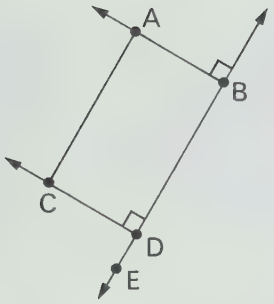
11. On the last day, the reduced price was \$1.98. How much was the reduction in price?

12. Ann worked many hours making hats for 12 d before the fair. The average time she spent each day was 2 h. How many hours did she spend making hats?

PROBLEM SOLVING

Checking Up

For this picture, name



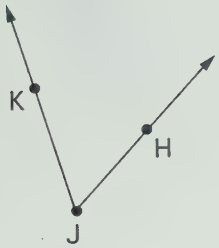
1. a line.
2. a line segment.
3. a ray.
4. two parallel rays.
5. two perpendicular rays.

Draw and label

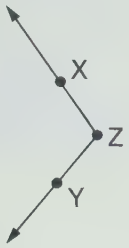
6. $\overrightarrow{LM}$.
7. $\overleftrightarrow{NO}$.
8. $\overline{PQ}$.
9. $\overline{RT}$ and $\overrightarrow{RX}$.

Name each angle. Measure the angle. Tell whether it is acute, right, obtuse, or straight.

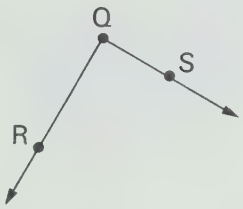
10.



11.



12.



Draw an angle for each measurement.

13. 155°
14. 180°
15. 22°

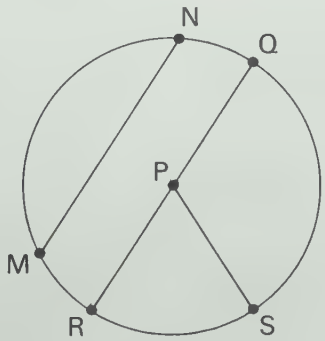
Complete.

	16.	17.	18.
Number of vertices	?	?	?
Number of sides	?	?	?
Number of lines of symmetry	?	?	?

Trace and then show a line of symmetry for the polygon in

19. Exercise 16.
20. Exercise 17.
21. Exercise 18.

For this circle, name

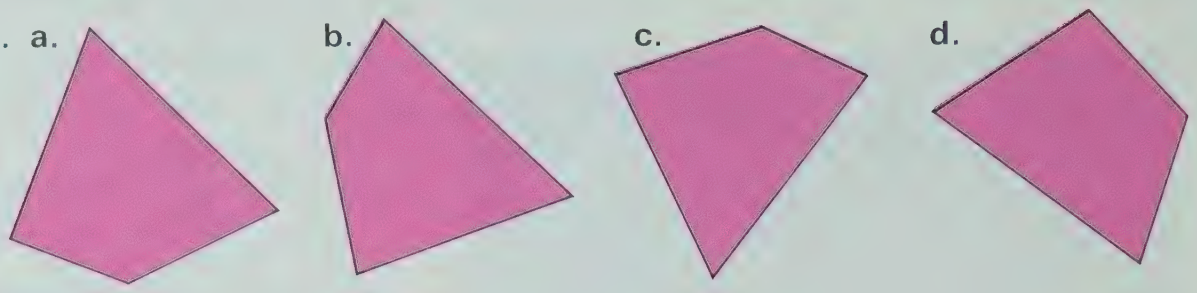


22. the centre.
23. a diameter.
24. a radius.
25. two chords.
26. a line of symmetry.

Turn the page for more exercises.

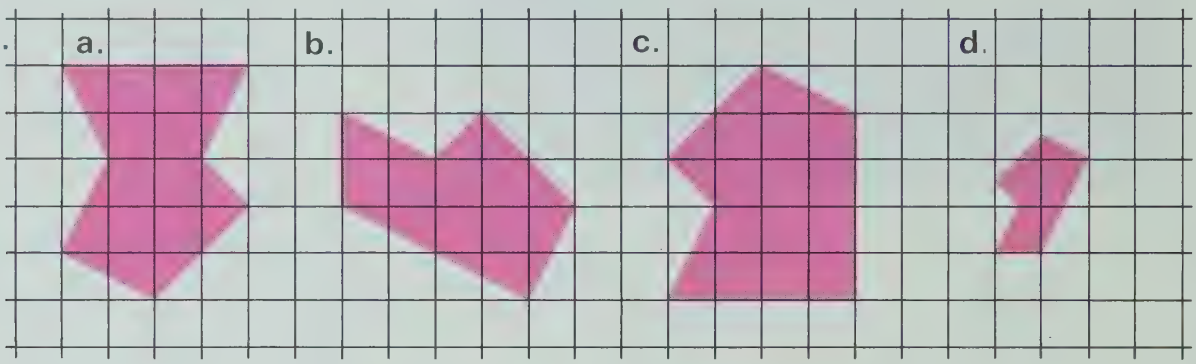
Use tracing paper and find two congruent shapes.

27. a. b. c. d.



Which two shapes are similar?

28.



Solve.

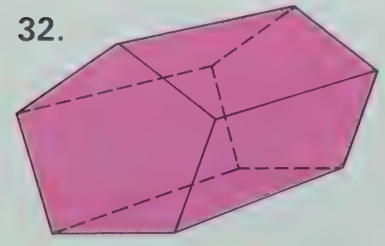
29. The distance on a map between two cities is 8 cm. The scale on the map is 1 cm to 50 km. What is the real distance between the cities?

Use a scale 1 cm to 5 m.

30. Make a scale drawing of a rectangle that is 30 m long and 25 m wide.

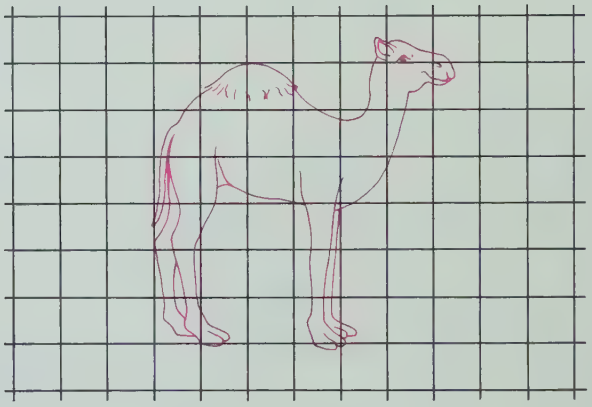
Draw a pattern for this pentagonal prism.

32.



Using a different grid,

31. copy this picture.



For the solid shape in Exercise 32,

33. how many vertices are there?

34. how many edges are there?

35. how many faces are there?

36. what is the shape of each face?

Checking Skills

Multiply.

1. 974 × 7	**2.** 638 × 9	**3.** 4573 × 3
4. 46 × 40	**5.** 502 × 10	**6.** 489 × 60
7. 59 × 87	**8.** 610 × 13	**9.** 615 × 72
10. 267 × 900	**11.** 508 × 978	**12.** 496 × 100
13. 893 × 160	**14.** 137 × 809	**15.** 629 × 585
16. 4.2 × 80	**17.** 4.71 × 35	**18.** 27.3 × 700
19. 39 × 5.7	**20.** 2.7 × 0.1	**21.** 98.7 × 6.3
22. 2.094 × 6.8	**23.** 54.7 × 3.15	**24.** 3.84 × 0.01
25. 0.4 × 0.1	**26.** 0.81 × 0.9	**27.** 0.473 × 0.2
28. 0.782 × 0.7	**29.** 0.56 × 0.01	**30.** 0.91 × 0.04

31. 47 × 21.48	**32.** 0.001 × 3.4
33. 9.6 × 6.6	**34.** 3.1 × 2.365
35. 0.01 × 0.1	**36.** 5.3 × 8.6
37. 0.42 × 0.27	**38.** 9.02 × 0.01
39. 0.9 × 0.001	**40.** 6.79 × 5.48
41. 0.3 × 0.276	**42.** 0.1 × 6.66

Divide. Give the quotient and remainder.

1. $7\overline{)64}$	**2.** $6\overline{)697}$
3. $8\overline{)1675}$	**4.** $9\overline{)58\,500}$
5. $70\overline{)4350}$	**6.** $80\overline{)6347}$
7. $32\overline{)489}$	**8.** $66\overline{)735}$
9. $54\overline{)32\,700}$	**10.** $10\overline{)20\,936}$
11. $600\overline{)27\,000}$	**12.** $700\overline{)31\,280}$
13. $482\overline{)29\,895}$	**14.** $327\overline{)46\,385}$
15. $150\overline{)92\,104}$	**16.** $903\overline{)60\,093}$

Divide. Use extra zeros if needed.

17. $5\overline{)2.65}$	**18.** $4\overline{)618}$
19. $7\overline{)49.28}$	**20.** $8\overline{)7.336}$
21. $58\overline{)60.436}$	**22.** $40\overline{)78.4}$
23. $71\overline{)7.313}$	**24.** $10\overline{)301}$
25. $30\overline{)11.46}$	**26.** $62\overline{)942.09}$
27. $100\overline{)692.5}$	**28.** $568\overline{)1448.4}$
29. $336\overline{)789.6}$	**30.** $825\overline{)1105.5}$
31. $654\overline{)624.57}$	**32.** $500\overline{)173}$

33. 465.2 ÷ 100	**34.** 5882 ÷ 85
35. 850.7 ÷ 94	**36.** 743 ÷ 100
37. 100 ÷ 800	**38.** 6.48 ÷ 45
39. 293.33 ÷ 10	**40.** 1323 ÷ 84
41. 125.8 ÷ 37	**42.** 53.9 ÷ 100

10 FRACTIONS

Writing Fractions

The students decorated the windows for spring.
Brad has 3 of 6 parts of his window decorated.

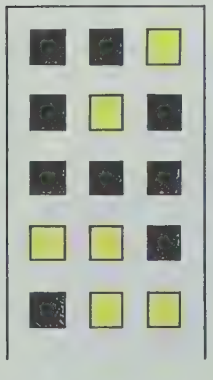
The fraction $\frac{3}{6}$ shows what part of the window Brad has decorated.

The fraction $\frac{1}{2}$ also shows how much is decorated.

$\frac{1}{2}$ ← **numerator**
$\frac{1}{2}$ ← **denominator**

Working Together

For the windows in this building,



1. give a fraction that shows how many of the windows have a light shining.

For the fraction you gave, which number

2. is the numerator?
3. is the denominator?

Complete each sentence with a fraction.

4. $\frac{\blacksquare}{\blacksquare}$ of the letters in the word "Manitoba" are the letter "a".
5. $\frac{\blacksquare}{\blacksquare}$ of the underlined words in this sentence begin with the letter "t".

Exercises

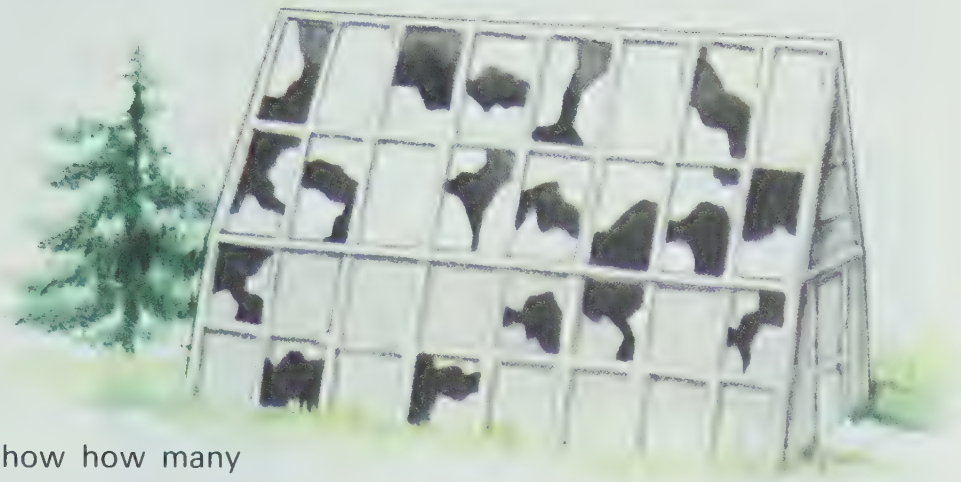
The hailstorm broke many panes of glass on one side of the greenhouse. Write a fraction to show how many panes have been broken in each row.

1. first row
roof

2. second row
roof

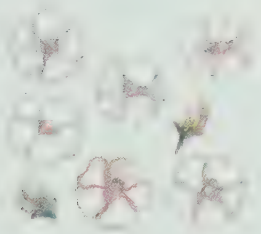
3. third row
side

4. fourth row

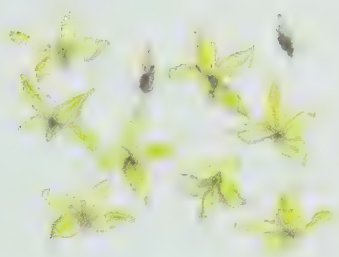


Write fractions to show how many of the buds have blossomed.

5.

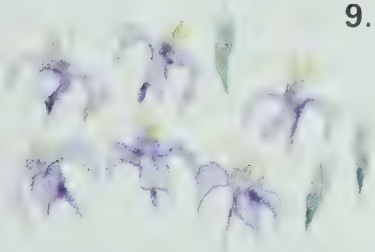


6.

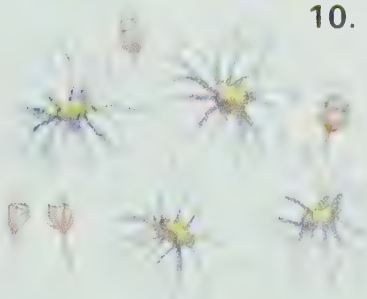


7.

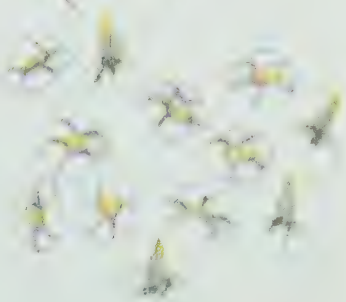
8.



9.



10.



Write the fraction

11. with numerator 3 and denominator 7.

12. with denominator 12 and numerator 7.

Write a sentence using a fraction for each of these.

13. The room has 5 windows.
3 windows are open.

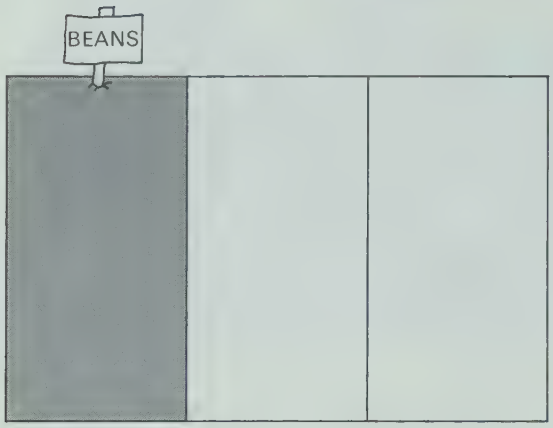
14. There are 16 windows.
12 have been washed.

*__15.__ 6 window frames were painted.
8 frames are still unpainted.

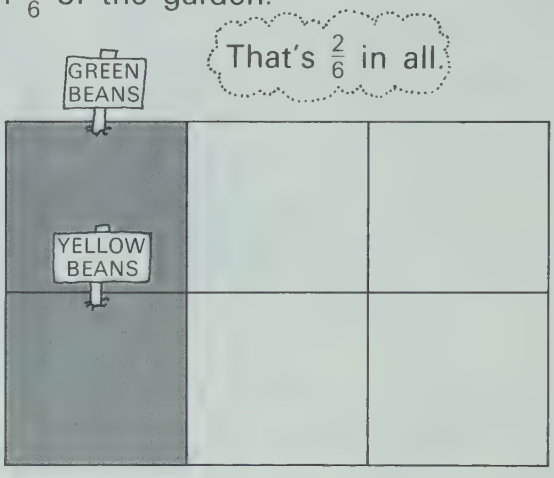
*__16.__ 7 windows are broken.
3 windows are not broken.

Multiplying to Find Equivalent Fractions

Fred wanted to plant two kinds of beans in $\frac{1}{3}$ of his garden.



To do this, he first doubled the number of sections in the garden. Then he planted green beans in $\frac{1}{6}$ of the garden and yellow beans in $\frac{1}{6}$ of the garden.



$$\frac{1}{3} \overset{1 \times 2}{\underset{3 \times 2}{=}} \frac{2}{6}$$

$\frac{1}{3}$ and $\frac{2}{6}$ both name the same amount.

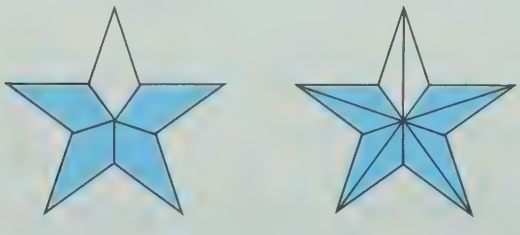
$\frac{1}{3}$ and $\frac{2}{6}$ are **equivalent fractions**.

Multiplying both the the numerator and the denominator by the same number gives an equivalent fraction.

Working Together

Complete.

1.



$$\frac{4}{5} \overset{4 \times 2}{\underset{5 \times 2}{=}} \frac{\blacksquare}{\blacksquare}$$

Multiply both the numerator and the denominator by 4 to find equivalent fractions.

2. $\frac{1}{2}$ **3.** $\frac{3}{5}$ **4.** $\frac{2}{3}$ **5.** $\frac{5}{8}$

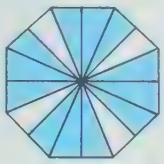
Exercises

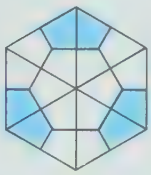
Write four equivalent fractions for each of these by multiplying both the numerator and the denominator by the same number. First use 2, then 3, then 4, and then 5.

1. $\frac{1}{4}$ **2.** $\frac{1}{6}$ **3.** $\frac{2}{5}$ **4.** $\frac{4}{7}$ **5.** $\frac{5}{8}$

Write two equivalent fractions for each picture.

6.

7. 

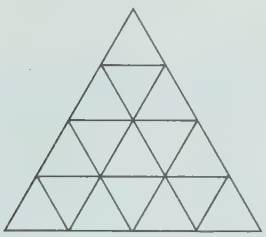
8. 

Write five fractions that are equivalent to each of these.

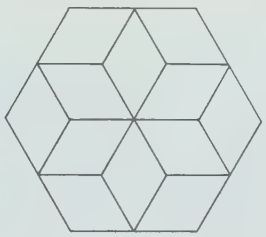
9. $\frac{1}{5}$ **10.** $\frac{5}{6}$ **11.** $\frac{3}{8}$ **12.** $\frac{4}{9}$ **13.** $\frac{7}{10}$

Copy and color each picture three different ways

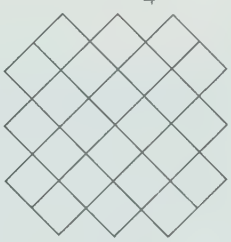
14. to show $\frac{1}{2}$.



15. to show $\frac{2}{3}$.



16. to show $\frac{3}{4}$.



How large do numbers get when you double them again and again?

Make a choice:

\$10 allowance each week for half a year

1¢ allowance the first week,
2¢ allowance the second week,
4¢ allowance the third week,
8¢ allowance the fourth week,
and so on for half a year.

1. How much would you have in half a year for each choice?

Fold a piece of paper in half. Then fold it in half again.

2. How many times can you keep folding the paper?

3. How thick does the folded paper get?

4. If a piece of paper is 0.1 mm thick unfolded, how thick would it get if you could fold it in half 20 times?

PROBLEM SOLVING

Dividing to Find Equivalent Fractions

Gail decided to give 9 of the 12 eggs to her friends.
She divided the 9 eggs into 3 gift boxes.

$\frac{9}{12}$ and $\frac{3}{4}$ are equivalent fractions.

$$\frac{9}{12} \overset{9 \div 3}{=} \frac{3}{4} \quad \left(12 \div 3\right)$$

Gail gave $\frac{3}{4}$ of the eggs to her friends.

9 and 12 are each divided by 3 in the above example. 3 is a **common factor** of 9 and 12.

When the numerator and the denominator have a common factor, division will give an equivalent fraction.

Use the common factor as the divisor.

Take another look:

4 is a common factor of 24 and 36, so

$$\frac{24}{36} \overset{24 \div 4}{\text{ is equivalent to }} \frac{6}{9} \quad \left(36 \div 4\right)$$

3 is a common factor of 6 and 9, so

$$\frac{6}{9} \overset{6 \div 3}{=} \frac{2}{3} \quad \left(9 \div 3\right)$$

2 and 3 have no common factor greater than 1. The fraction $\frac{2}{3}$ is in **lowest terms**.

Working Together

Give one factor of each.

1. 6 **2.** 14

Give a common factor of the numerator and the denominator.

3. $\frac{9}{24}$ **4.** $\frac{10}{40}$

Divide the numerator and the denominator by a common factor to get an equivalent fraction.

5. $\frac{3}{9}$ **6.** $\frac{12}{16}$ **7.** $\frac{10}{25}$

Are the fractions you get in lowest terms?

Exercises

Divide the numerator and the denominator by a common factor to get an equivalent fraction.

Ring the fractions you get that are in lowest terms.

1. $\frac{4}{6}$ **2.** $\frac{8}{64}$ **3.** $\frac{10}{45}$ **4.** $\frac{12}{30}$ **5.** $\frac{20}{32}$ **6.** $\frac{9}{21}$ **7.** $\frac{5}{30}$

8. $\frac{18}{30}$ **9.** $\frac{70}{80}$ **10.** $\frac{10}{24}$ **11.** $\frac{7}{28}$ **12.** $\frac{28}{49}$ **13.** $\frac{36}{40}$ **14.** $\frac{15}{20}$

Finding the **greatest common factor** of the numerator and the denominator allows you to write a fraction in lowest terms in one step.

The factors of 24 are 1, 2, 3, 4, 6, 8, 12, 24.

The factors of 40 are 1, 2, 4, 5, 8, 10, 20, 40.

The common factors of 24 and 40 are 1, 2, 4, 8.

The greatest common factor is 8.

$\frac{24}{40} = \frac{3}{5}$ (24 ÷ 8, 40 ÷ 8)

lowest terms

15. Find the greatest common factor of

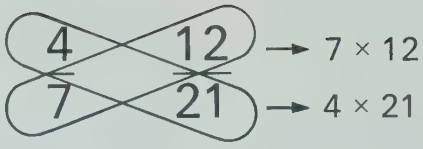
28 and 36	30 and 36	30 and 40	35 and 40	35 and 84	48 and 84

16. Write the fraction in lowest terms that is equivalent to

$\frac{28}{36}$	$\frac{30}{36}$	$\frac{30}{40}$	$\frac{35}{40}$	$\frac{35}{84}$	$\frac{48}{84}$

Cross Products

Cross products can be used to check whether two fractions are equivalent.

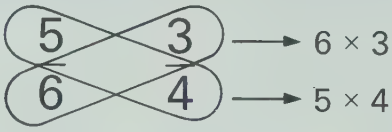


For the fractions $\frac{4}{7}$ and $\frac{12}{21}$, both cross products are 84.

When the cross products for two fractions are equal, the fractions are equivalent.

$$\frac{4}{7} = \frac{12}{21}$$

When the cross products for two fractions are not equal, the fractions are not equivalent.

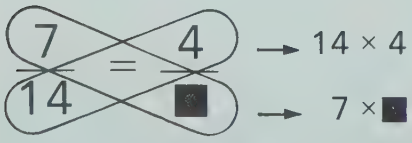


For $\frac{5}{6}$ and $\frac{3}{4}$ the cross products are 20 and 18.

$$\frac{5}{6} \neq \frac{3}{4}$$

The symbol $\neq$ means "is not equal to".

Cross products can be used to find a number that will give two equivalent fractions.

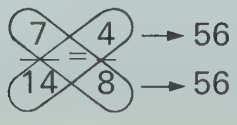


For equivalent fractions, $7 \times \blacksquare$ must equal 14×4.

For $7 \times \blacksquare = 56$, 8 is the value for ■.

$7 \times 8 = 56$

Write $\frac{7}{14} = \frac{4}{8}$ and use cross products to check.



The cross products are equal. $\frac{7}{14}$ and $\frac{4}{8}$ are equivalent.

Working Together

Find the cross products. Are the fractions equivalent?

1. $\frac{2}{3}, \frac{6}{9}$ **2.** $\frac{7}{9}, \frac{5}{6}$ **3.** $\frac{6}{8}, \frac{9}{12}$

Write a sentence showing equal cross products.

Example: For $\frac{4}{5} = \frac{12}{\blacksquare}$,

write $4 \times \blacksquare = 5 \times 12$.

4. $\frac{6}{21} = \frac{2}{\blacksquare}$ **5.** $\frac{6}{9} = \frac{\blacksquare}{21}$

Find the missing term.

Example: For $5 \times \blacksquare = 7 \times 15$, or 105, you can divide 105 by 5 to find the value for $\blacksquare$

6. $8 \times \blacksquare = 2 \times 20$ **7.** $\frac{4}{12} = \frac{5}{\blacksquare}$

Exercises

Find the cross products. Are the fractions equivalent?

1. $\frac{15}{20}, \frac{3}{4}$ **2.** $\frac{2}{5}, \frac{4}{9}$ **3.** $\frac{1}{6}, \frac{6}{36}$ **4.** $\frac{7}{12}, \frac{5}{9}$

5. $\frac{8}{16}, \frac{5}{10}$ **6.** $\frac{7}{28}, \frac{4}{16}$ **7.** $\frac{9}{15}, \frac{12}{21}$ **8.** $\frac{9}{24}, \frac{6}{16}$

Use cross products to find the missing term.

9. $\frac{1}{5} = \frac{7}{\blacksquare}$ **10.** $\frac{3}{5} = \frac{\blacksquare}{25}$ **11.** $\frac{3}{7} = \frac{6}{\blacksquare}$ **12.** $\frac{5}{9} = \frac{\blacksquare}{27}$

13. $\frac{3}{12} = \frac{\blacksquare}{20}$ **14.** $\frac{8}{12} = \frac{10}{\blacksquare}$ **15.** $\frac{3}{6} = \frac{\blacksquare}{4}$ **16.** $\frac{6}{15} = \frac{10}{\blacksquare}$

17. $\frac{14}{16} = \frac{21}{\blacksquare}$ **18.** $\frac{15}{18} = \frac{\blacksquare}{12}$ **19.** $\frac{14}{24} = \frac{21}{\blacksquare}$ **20.** $\frac{12}{16} = \frac{\blacksquare}{24}$

Kevin is $\frac{1}{7}$ as old as Ida.

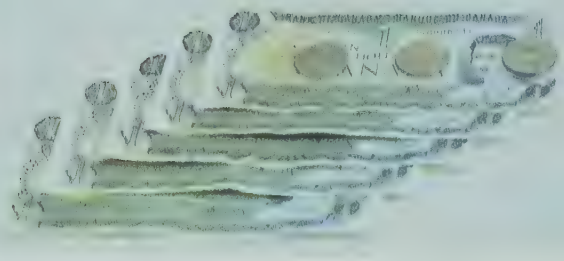
1. How will Kevin's age compare with Ida's in another year?
2. How will Kevin's age compare with Ida's in two years?
3. How many years will it be until Kevin is $\frac{1}{3}$ as old as Ida?
4. How many years will it be until Kevin is $\frac{1}{2}$ as old as Ida?

PROBLEM SOLVING

Changing to Improper Fractions

Emilie earned $5.75 on Saturday. She was paid with 5 one-dollar bills and 3 quarters. To put her money into her quarter bank, she must change it all to quarters. How many quarters would she have for her bank?

$5\frac{3}{4}$ dollars



$5\frac{3}{4}$ = $\frac{20}{4}$ and $\frac{3}{4}$

$5\frac{3}{4} = \frac{23}{4}$

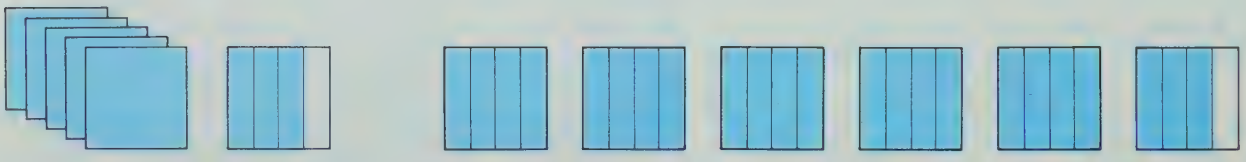
Emilie would have 23 quarters for her quarter bank.

$\frac{23}{4}$ is an **improper fraction**.

$5\frac{3}{4}$ is a number in **mixed form**.

In an improper fraction, the numerator is greater than or equal to the denominator. In a proper fraction, the numerator is less than the denominator. A number in mixed form is a whole number together with a fraction.

To change a number in mixed form, such as $5\frac{3}{4}$, to an improper fraction,



$5\frac{3}{4}$ = 5 × 4 fourths + 3 fourths

23 fourths

multiply the whole number and the denominator. Then add the numerator.

$5\frac{3}{4} = \frac{23}{4}$

Working Together

Multiply the whole number and the denominator to find the numerator of the improper fraction.

1. $3 = \frac{\blacksquare}{4}$ **2.** $7 = \frac{\blacksquare}{3}$ **3.** $4 = \frac{\blacksquare}{5}$

Multiply the whole number and the denominator. Then add the numerator to change each of these to an improper fraction.

Example: For $3\frac{1}{8}$, use $(3 \times 8) + 1$
and write $3\frac{1}{8} = \frac{25}{8}$.

4. $7\frac{1}{2}$ **5.** $4\frac{2}{3}$ **6.** $5\frac{4}{7}$ **7.** $8\frac{7}{12}$

Exercises

Write 4 as an improper fraction

1. showing halves. **2.** showing thirds. **3.** showing tenths.

Write 5 as an improper fraction

4. showing fourths. **5.** showing eighths. **6.** showing twelfths.

Write each as an improper fraction.

7. $3\frac{1}{3}$	**8.** $1\frac{3}{8}$	**9.** $8\frac{1}{5}$	**10.** $7\frac{5}{6}$	**11.** $4\frac{4}{5}$
12. $6\frac{5}{12}$	**13.** $5\frac{2}{7}$	**14.** $7\frac{5}{8}$	**15.** $2\frac{1}{4}$	**16.** $9\frac{4}{9}$
17. $7\frac{2}{5}$	**18.** $5\frac{3}{4}$	**19.** $10\frac{5}{9}$	**20.** $15\frac{3}{10}$	**21.** $12\frac{3}{5}$
22. $10\frac{7}{9}$	**23.** $4\frac{7}{8}$	**24.** $21\frac{7}{10}$	**25.** $4\frac{5}{7}$	**26.** $3\frac{11}{12}$

Add, subtract, multiply, or divide. Show your work.

1. 5232 + 5232	**2.** 10 464 − 9 293	**3.** 1171 × 72
4. 84 312 ÷ 24	**5.** 3513 − 1814	**6.** 1699 × 234
7. 397 566 ÷ 78	**8.** 5 097 + 24 903	**9.** 30 000 − 29 624
10. 376 × 148	**11.** 55 648 + 11 564	**12.** 67 212 ÷ 12
13. 5601 − 634	**14.** 4967 + 6778	

KEEPING SHARP

Changing Improper Fractions

Claudette needs one quarter-hour to weave each pot holder. How much time does she need to weave 13 pot holders?

How long is 13 quarter-hours?

To change an improper fraction, such as $\frac{13}{4}$, to a number in mixed form, divide the numerator by the denominator.

$$4\overline{)13}\quad 3 \text{ R } 1$$

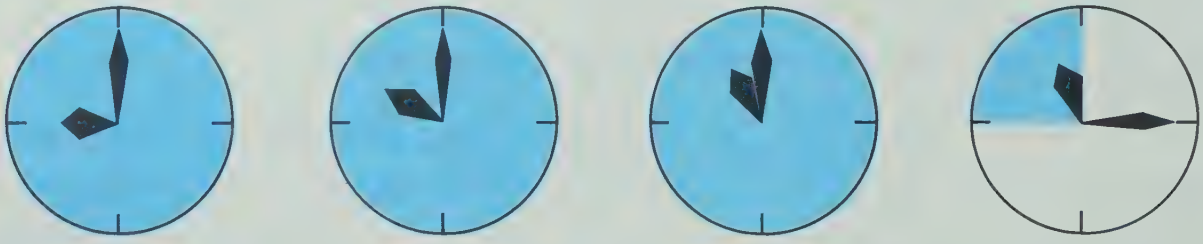
3 wholes

1 fourth of another whole

$3\frac{1}{4}$

The improper fraction $\frac{13}{4}$ is equal to $3\frac{1}{4}$ when it is changed to mixed form.

Claudette needs 3 h and 1 quarter of another hour to weave 13 pot holders.



Working Together

Divide the numerator by the denominator. Show the result as a number in mixed form or as a whole number.

Example: For $\frac{17}{3}$, use $3\overline{)17}$ 5 R2 and write $5\frac{2}{3}$.

1. $\frac{12}{5}$ **2.** $\frac{54}{8}$ **3.** $\frac{36}{9}$ **4.** $\frac{76}{6}$

Exercises

Write each improper fraction as a number in mixed form or as a whole number.

1. $\frac{19}{5}$	**2.** $\frac{15}{2}$	**3.** $\frac{40}{5}$	**4.** $\frac{108}{10}$	**5.** $\frac{24}{9}$	**6.** $\frac{117}{12}$
7. $\frac{66}{8}$	**8.** $\frac{27}{3}$	**9.** $\frac{86}{7}$	**10.** $\frac{26}{4}$	**11.** $\frac{42}{6}$	**12.** $\frac{69}{15}$
13. $\frac{84}{9}$	**14.** $\frac{34}{4}$	**15.** $\frac{30}{2}$	**16.** $\frac{144}{12}$	**17.** $\frac{34}{6}$	**18.** $\frac{25}{10}$

For Exercises 1 to 18,

19. list the results in lowest terms.

Write a sentence using a number in mixed form.

20. The boy ate 9 quarter waffles.

21. She played for 51 quarters of last season's basketball games.

A whole number greater than 1 that has itself and 1 as its only whole-number factors is a **prime number**.

$37 = 1 \times 37$

This is the only way to show 37 as a product of whole numbers. 37 is a prime number.

A number that is not a prime number is a **composite number**.

$35 = 1 \times 35$ $35 = 7 \times 5$

35 has other whole-number factors besides 1 and 35. 35 is a composite number.

List the numbers from 2 to 200.

1. After 2, every second number is not prime. Why? After 2, cross every second number off the list.

2. After 3, every third number is not prime. Why? After 3, cross every third number off the list.

3. Complete: ▒ is the next prime number after 3. After ▒, every fifth number is not prime. Why? After ▒, cross every ▒th number off the list.

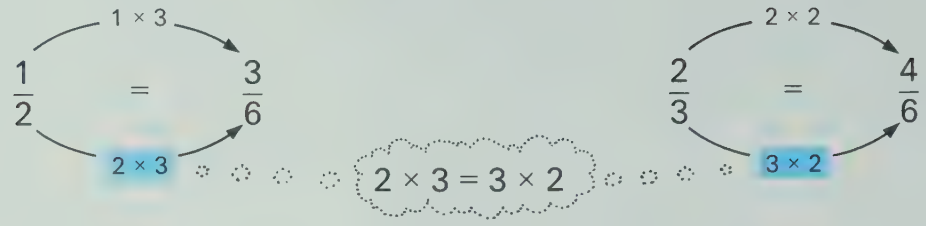
4. Continue the pattern begun with steps 1 to 3. Then tell what is true about the numbers that are not crossed off.

5. Tell what is true about all the numbers that are crossed off.

try this

Finding Like Denominators

$\frac{1}{2}$ and $\frac{2}{3}$ have **unlike denominators**.
The unlike denominators are 2 and 3.



$\frac{1}{2}$ is equivalent to $\frac{3}{6}$.

$\frac{2}{3}$ is equivalent to $\frac{4}{6}$.

$\frac{3}{6}$ and $\frac{4}{6}$ have **like denominators**.

Like denominators are often called **common denominators**.

To find like denominators for two fractions that have unlike denominators, multiply the unlike denominators.

Working Together

For each pair, use the product of the unlike denominators to help you find equivalent fractions with like denominators.

1. $\frac{2}{3}, \frac{1}{5}$ **2.** $\frac{3}{4}, \frac{1}{10}$ **3.** $2\frac{4}{5}, 1\frac{5}{6}$

Exercises

For each pair, find equivalent fractions with like denominators.

1. $\frac{1}{3}, \frac{1}{4}$ **2.** $\frac{1}{2}, \frac{1}{3}$ **3.** $\frac{1}{8}, \frac{1}{5}$ **4.** $\frac{2}{3}, \frac{3}{4}$ **5.** $\frac{1}{2}, \frac{4}{5}$

6. $\frac{5}{8}, \frac{2}{3}$ **7.** $\frac{7}{9}, \frac{3}{4}$ **8.** $\frac{5}{9}, \frac{1}{2}$ **9.** $\frac{2}{3}, \frac{3}{5}$ **10.** $\frac{7}{8}, \frac{8}{9}$

11. $\frac{1}{4}, \frac{5}{6}$ **12.** $\frac{2}{9}, \frac{1}{6}$ **13.** $\frac{5}{8}, \frac{5}{12}$ **14.** $\frac{5}{6}, \frac{9}{10}$ **15.** $\frac{1}{9}, \frac{1}{12}$

16. $1\frac{1}{2}, 2\frac{4}{5}$ **17.** $2\frac{3}{4}, \frac{2}{5}$ **18.** $3\frac{1}{5}, 1\frac{5}{6}$ **19.** $1\frac{5}{6}, 3\frac{3}{8}$ **20.** $1\frac{3}{10}, 2\frac{1}{6}$

Find three fractions with like denominators that are equivalent to

21. $\frac{1}{2}, \frac{1}{3}$, and $\frac{1}{4}$. **22.** $\frac{2}{3}, \frac{3}{5}$, and $\frac{1}{6}$. **23.** $\frac{5}{6}, \frac{1}{2}$, and $\frac{3}{8}$.

Common Multiples as Like Denominators

Multiples of 4 are	4,	8,	12,	16,	20,	24,	28,	32,	36,	and so on.
Multiples of 6 are	6,		12,	18,		24,	30,		36,	and so on.
Common multiples of 4 and 6 are			12,			24,			36,	and so on.

Any common multiple can be used for like denominators.

For $\frac{3}{4}$ and $\frac{5}{6}$,

$\frac{3}{4} = \frac{9}{12}$ $\quad \frac{5}{6} = \frac{10}{12}$

$\frac{3}{4} = \frac{18}{24}$ $\quad \frac{5}{6} = \frac{20}{24}$

Sometimes there are common multiples that are less than the product of the unlike denominators.

Working Together

Give a common multiple of the denominators that is *less than* their product.

1. $\frac{1}{3}, \frac{1}{6}$ **2.** $\frac{1}{4}, \frac{3}{10}$ **3.** $\frac{5}{8}, \frac{7}{12}$

Find equivalent fractions with like denominators. Use the common multiples from Exercises 1 to 3.

4. $\frac{1}{3}, \frac{1}{6}$ **5.** $\frac{1}{4}, \frac{3}{10}$ **6.** $1\frac{5}{8}, 2\frac{7}{12}$

Exercises

Find equivalent fractions with like denominators. Use denominators that are *less than* the product of the unlike denominators.

1. $\frac{1}{2}, \frac{1}{4}$ **2.** $\frac{1}{8}, \frac{3}{10}$ **3.** $\frac{3}{4}, \frac{7}{8}$ **4.** $\frac{1}{4}, \frac{1}{6}$ **5.** $\frac{5}{12}, \frac{1}{2}$

6. $\frac{3}{8}, \frac{5}{12}$ **7.** $\frac{5}{6}, \frac{7}{9}$ **8.** $1\frac{1}{5}, \frac{1}{10}$ **9.** $3\frac{2}{3}, 2\frac{7}{9}$ **10.** $1\frac{7}{12}, 2\frac{5}{9}$

In the charts at the top of this page, 12 is the **least common multiple** of 4 and 6.

List multiples for each. Ring the least common multiple.

11. 6, 10 **12.** 8, 4 **13.** 4, 10 **14.** 6, 8 **15.** 9, 12

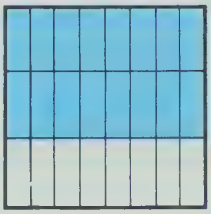
For each pair, write equivalent fractions using the least common multiple as the common denominator.

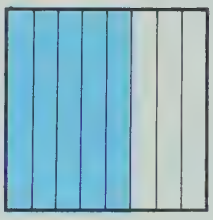
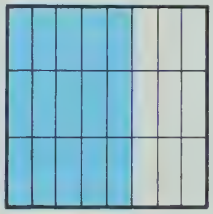
16. $\frac{1}{6}, \frac{3}{10}$ **17.** $\frac{5}{8}, \frac{3}{4}$ **18.** $\frac{3}{4}, \frac{7}{10}$ **19.** $\frac{5}{6}, \frac{5}{8}$ **20.** $\frac{4}{9}, \frac{5}{12}$

Comparing Fractions

Which is greater, $\frac{2}{3}$ or $\frac{5}{8}$?

3×8, or 24, is a common multiple of 3 and 8.

$\frac{2}{3}$ is equivalent to $\frac{16}{24}$ 

 $\frac{5}{8}$ is equivalent to  $\frac{15}{24}$

$16 > 15$

$\frac{16}{24} > \frac{15}{24}$

$$\frac{2}{3} > \frac{5}{8}$$

Working Together

Give equivalent fractions with like denominators for each pair.

1. $\frac{5}{8}, \frac{3}{4}$ **2.** $\frac{1}{6}, \frac{3}{10}$

Which is greater? Use equivalent fractions with like denominators.

3. $\frac{3}{4}, \frac{2}{3}$ **4.** $\frac{4}{6}, \frac{5}{8}$

Exercises

Use $>$, $<$ or $=$ to make true statements.

1. $\frac{1}{3} \bigcirc \frac{4}{9}$ **2.** $\frac{3}{5} \bigcirc \frac{2}{3}$ **3.** $\frac{5}{8} \bigcirc \frac{3}{5}$ **4.** $\frac{4}{5} \bigcirc \frac{8}{10}$

5. $\frac{2}{9} \bigcirc \frac{1}{4}$ **6.** $\frac{7}{8} \bigcirc \frac{5}{6}$ **7.** $\frac{5}{6} \bigcirc \frac{8}{10}$ **8.** $\frac{3}{4} \bigcirc \frac{4}{5}$

9. $3\frac{2}{4} \bigcirc 3\frac{3}{6}$ **10.** $1\frac{2}{5} \bigcirc 1\frac{3}{7}$ **11.** $2\frac{3}{8} \bigcirc 2\frac{5}{12}$ **12.** $7\frac{2}{3} \bigcirc 7\frac{5}{9}$

On a job, would you rather

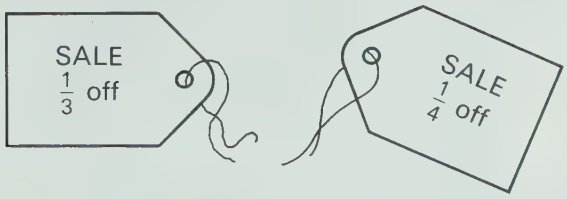
13. do $\frac{4}{7}$ of the work or do $\frac{3}{5}$ of the work?

14. earn $\frac{4}{7}$ of the money or earn $\frac{3}{5}$ of the money?

Practice

Which is the better sale

1. $\frac{1}{3}$ off or $\frac{1}{4}$ off?



2. prices marked down to $\frac{2}{3}$, or to $\frac{3}{5}$ of the original price?

***3.** $\frac{2}{5}$ off, or prices marked down to $\frac{3}{4}$ of the original price?

Write three fractions equivalent to

4. $\frac{1}{2}$. **5.** $\frac{3}{4}$. **6.** $\frac{5}{7}$.

Write a fraction in lowest terms for

7. $\frac{18}{24}$. **8.** $\frac{14}{42}$. **9.** $\frac{30}{75}$.

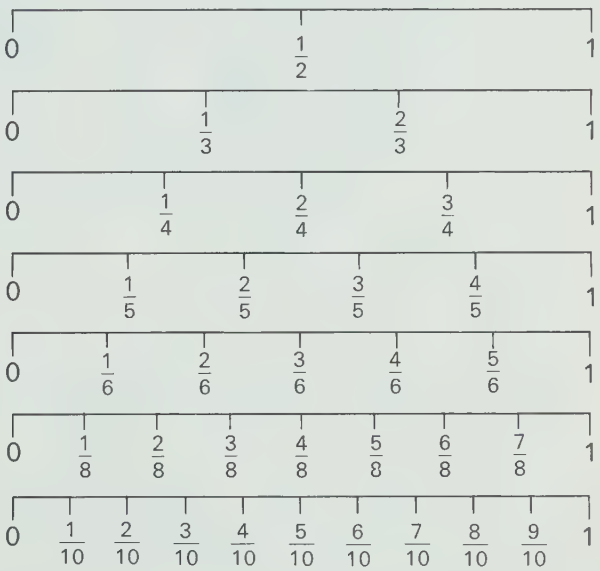
Write an improper fraction for

10. $7\frac{2}{3}$. **11.** $4\frac{7}{8}$. **12.** $3\frac{5}{12}$.

Write a number in mixed form for

13. $\frac{25}{4}$. **14.** $\frac{39}{7}$. **15.** $\frac{23}{10}$.

Use the number lines.
Find an equivalent fraction for each of these.



16. $\frac{1}{2}$ **17.** $\frac{1}{3}$ **18.** $\frac{1}{4}$

19. $\frac{6}{8}$ **20.** $\frac{4}{10}$ **21.** $\frac{4}{6}$

Use $>$ or $<$ to make true statements.

Use the number lines to help you.

22. $\frac{2}{3} \bigcirc \frac{4}{5}$ **23.** $\frac{3}{4} \bigcirc \frac{7}{10}$

24. $\frac{1}{3} \bigcirc \frac{3}{10}$ **25.** $\frac{1}{3} \bigcirc \frac{3}{8}$

Here is a way to write a fraction in lowest terms.

$$\frac{42}{56} = \frac{\overset{1}{\cancel{2}} \times 3 \times \overset{1}{\cancel{7}}}{\underset{1}{\cancel{2}} \times 2 \times 2 \times \underset{1}{\cancel{7}}} \qquad \frac{42}{56} = \frac{3}{4}$$

For each of these, write the numerator and denominator as products of factors that are prime numbers. Then divide by the common factors to find a fraction in lowest terms.

1. $\frac{6}{15}$ **2.** $\frac{15}{24}$ **3.** $\frac{24}{36}$ **4.** $\frac{36}{42}$ **5.** $\frac{42}{70}$ **6.** $\frac{70}{84}$

try this

Logical Thinking

Solving these problems requires careful thinking.

1. Alice, Byron, Cathy, Dinah, and Edmund want to catch the bus at 18 : 00.

Alice's watch is 5 min fast. She thinks it is 10 min slow.

Byron's watch is 5 min slow. He thinks it is 10 min fast.

Cathy's watch is 10 min slow. She thinks it is 5 min fast.

Dinah's watch is 5 min fast. She thinks it is 10 min fast.

Edmund's watch is 5 min slow. He thinks it is 10 min slow.

Each student leaves home allowing exactly enough time to catch the bus according to the time each thinks it is.

Who will miss the bus?

2. All the trains from Portville go to Barton. From Barton, some trains go to Clark Valley. Some trains go from Barton to Durham and then to Elk River. Other trains go from Barton to Fairview and then to Murray. The fare is $3 to Clark Valley, Elk River, or Murray, $1 to Barton, and $2 to the other places.

Ivy is in a hurry. She bought a ticket for $2 at the Portville train station. The first train is going to Elk River. Ivy did not get on the first train. Where is Ivy going?

3. Karen, Lea, Matt, and Nate each live on a different floor of a four-storey apartment building. Their ages are 7, 10, 11, and 12, but not necessarily in that order. Karen lives directly above the 11-year-old and directly below the 10-year-old. When Lea leaves her apartment, she passes the floor where the 7-year-old lives. Lea is more than one floor away from Nate. Nate is more than a year younger than Lea.

What is the age of each student?
On which floor does each student live?

PROBLEM SOLVING

Checking Up

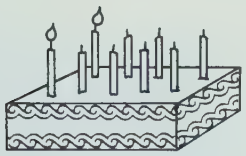
For the fraction $\frac{4}{5}$,

1. what is the numerator?

2. what is the denominator?

Write a fraction that shows how many candles are burning.

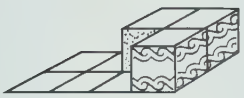
3.



4.

Write a fraction that shows how much cake is left.

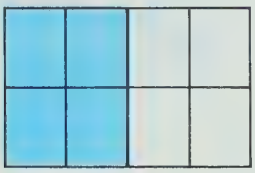
5.



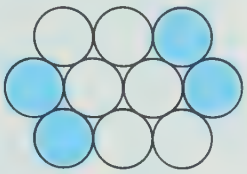
6.

Write two equivalent fractions that show how much of each picture is blue.

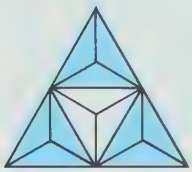
7.



8.



9.



Write four fractions that are equivalent to each of these.

10. $\frac{1}{7}$ **11.** $\frac{2}{3}$ **12.** $\frac{5}{10}$

Write the fraction in lowest terms that is equivalent to

13. $\frac{10}{12}$ **14.** $\frac{6}{18}$ **15.** $\frac{28}{36}$

Are the two fractions equivalent? Use cross products.

16. $\frac{1}{4}, \frac{3}{12}$ **17.** $\frac{15}{24}, \frac{10}{16}$ **18.** $\frac{2}{3}, \frac{5}{7}$ **19.** $\frac{6}{9}, \frac{8}{12}$

Find the missing term.

20. $\frac{3}{6} = \frac{\blacksquare}{8}$ **21.** $\frac{6}{10} = \frac{9}{\blacksquare}$ **22.** $\frac{5}{9} = \frac{\blacksquare}{36}$ **23.** $\frac{6}{8} = \frac{12}{\blacksquare}$

Write 3 as an improper fraction

24. showing halves. **25.** showing thirds. **26.** showing fourths.

Write each of these as an improper fraction.

27. $3\frac{1}{2}$ **28.** $1\frac{7}{10}$ **29.** $7\frac{3}{4}$

Write as a whole number or as a number in mixed form.

30. $\frac{10}{3}$ **31.** $\frac{36}{12}$ **32.** $\frac{14}{5}$

For each pair, find equivalent fractions with like denominators.

33. $\frac{1}{2}, \frac{3}{5}$ **34.** $\frac{5}{6}, \frac{7}{8}$ **35.** $1\frac{3}{4}, 3\frac{1}{3}$

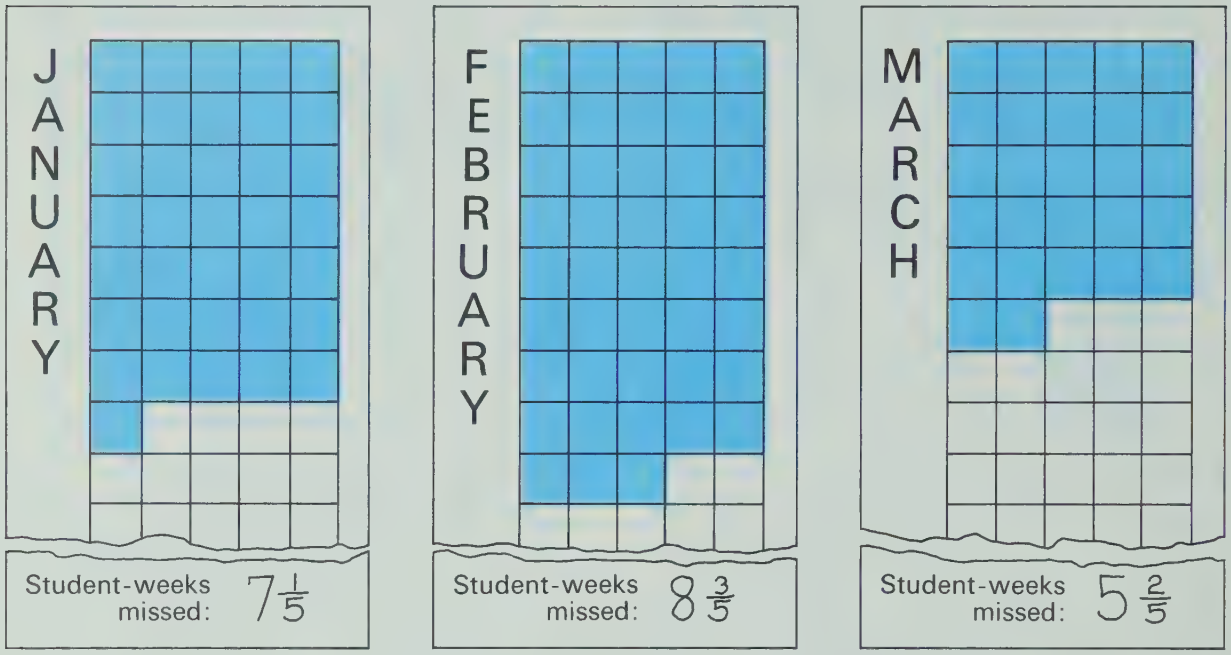
Use $>$, $<$, or $=$ to make true statements.

36. $\frac{3}{4} \bigcirc \frac{5}{7}$ **37.** $\frac{5}{12} \bigcirc \frac{4}{9}$

11 OPERATIONS WITH FRACTIONS

Adding and Subtracting with Like Denominators

Industry counts personnel days lost if they want to know how many days of work were missed by any or all of their workers. The students kept a similar record and recorded "student-weeks" lost by classmates.



How many student-weeks of school were missed in January and February together?

Add $7\frac{1}{5}$ and $8\frac{3}{5}$.

Add fifths. Then add ones.

$$\begin{array}{r} 7\frac{1}{5} \\ 8\frac{3}{5} \\ \hline 15\frac{4}{5} \end{array}$$

The students missed $15\frac{4}{5}$ student-weeks of school in January and February.

How many fewer student-weeks were missed in March than in February?

Subtract $5\frac{2}{5}$ from $8\frac{3}{5}$.

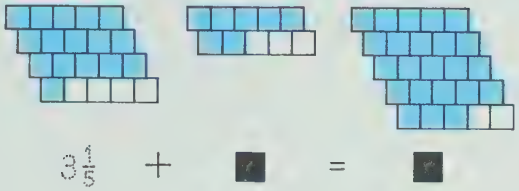
Subtract fifths. Then subtract ones.

$$\begin{array}{r} 8\frac{3}{5} \\ 5\frac{2}{5} \\ \hline 3\frac{1}{5} \end{array}$$

The students missed $3\frac{1}{5}$ fewer student-weeks in March than in February.

Working Together

Complete the addition sentence.

1. 

Complete the subtraction sentence.

2.

Add.

3. $\frac{1}{4}$
$\frac{2}{4}$ +

4. $\frac{4}{9} + \frac{2}{9}$

5. $4\frac{3}{12} + 1\frac{7}{12}$

Subtract.

6. $\frac{5}{8}$
$\frac{3}{8}$ −

7. $\frac{3}{4} - \frac{1}{4}$

8. $4\frac{2}{5} - 2\frac{1}{5}$

Exercises

Add.

1. $\frac{1}{6}$
$\frac{3}{6}$ +

2. $1\frac{1}{3}$
$2\frac{1}{3}$ +

3. $\frac{2}{7}$
$\frac{3}{7}$ +

4. $\frac{2}{5} + \frac{2}{5}$

5. $3\frac{1}{8} + 5\frac{3}{8}$

Subtract.

6. $\frac{4}{7}$
$\frac{1}{7}$ −

7. $9\frac{11}{12}$
$5\frac{6}{12}$ −

8. $\frac{9}{10}$
$\frac{3}{10}$ −

9. $\frac{5}{6} - \frac{2}{6}$

10. $4\frac{2}{3} - 3\frac{1}{3}$

Solve.

11. Percy painted $\frac{3}{4}$ of a wall in the morning and $\frac{1}{4}$ of the wall in the afternoon. How much more of the wall did he paint in the morning than in the afternoon?

Percy spent $\frac{1}{3}$ of the morning practising the piano and of the morning playing hockey. How much of the morning did he spend on both activities?

Write the next three numbers in each pattern.
Then tell whether the numbers in each pattern are increasing, decreasing, or remaining the same.

1. $\frac{1}{12}, \frac{2}{12}, \frac{3}{12}, \frac{4}{12}, \ldots$

2. $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \ldots$

3. $\frac{1}{2}, \frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \ldots$

4. $\frac{2}{4}, \frac{3}{9}, \frac{4}{16}, \frac{5}{25}, \frac{6}{36}, \frac{7}{49}, \ldots$

5. $\frac{1}{3}, \frac{2}{5}, \frac{3}{7}, \frac{4}{9}, \ldots$

6. $\frac{2}{3}, \frac{3}{5}, \frac{4}{7}, \frac{5}{9}, \ldots$

7. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \ldots$

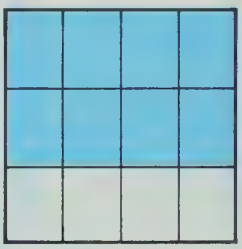
try this

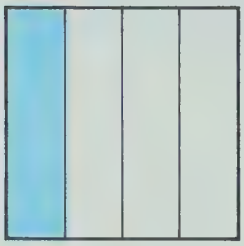
Adding Fractions with Unlike Denominators

Find the sum of $\frac{2}{3}$ and $\frac{1}{4}$.

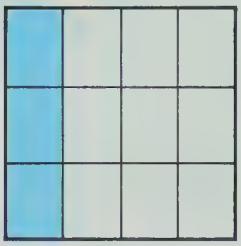
To add fractions with unlike denominators,
find equivalent fractions with like denominators.
Then add the numerators.

$$\frac{2}{3} = \frac{8}{12}$$

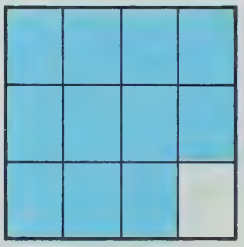




$$\frac{1}{4} = \frac{3}{12}$$



$$\frac{11}{12}$$



The sum of $\frac{2}{3}$ and $\frac{1}{4}$ is $\frac{11}{12}$.

Working Together

For the pair of fractions in each addition, give equivalent fractions that have like denominators.

1. $\frac{1}{2} + \frac{1}{4} = \frac{\blacksquare}{\blacksquare} + \frac{\blacksquare}{\blacksquare}$

2. $\frac{1}{8} + \frac{2}{3} = \frac{\blacksquare}{\blacksquare} + \frac{\blacksquare}{\blacksquare}$

Find equivalent fractions with like denominators. Then add.

3. $\frac{2}{5}$
$\frac{1}{4}$

4. $\frac{3}{4}$
$\frac{1}{12}$

5. $\frac{3}{7} + \frac{1}{3}$

6. $\frac{1}{2} + \frac{1}{10}$

Exercises

Add.

1. $\frac{1}{3}$ + $\frac{1}{2}$

2. $\frac{1}{2}$ + $\frac{3}{10}$

3. $\frac{1}{5}$ + $\frac{1}{2}$

4. $\frac{3}{4}$ + $\frac{1}{20}$

5. $\frac{3}{8}$ + $\frac{1}{6}$

6. $\frac{5}{12}$ + $\frac{1}{4}$

7. $\frac{2}{5}$ + $\frac{1}{10}$

8. $\frac{3}{20}$ + $\frac{3}{4}$

9. $\frac{1}{8}$ + $\frac{3}{4}$

10. $\frac{7}{20} + \frac{2}{5}$

11. $\frac{2}{3} + \frac{1}{12}$

12. $\frac{1}{7} + \frac{2}{3}$

13. $\frac{1}{3} + \frac{1}{6}$

14. $\frac{1}{6} + \frac{3}{4}$

15. $\frac{3}{10} + \frac{1}{5}$

16. $\frac{1}{3} + \frac{5}{12}$

17. $\frac{3}{5} + \frac{3}{20}$

18. $\frac{1}{2} + \frac{1}{6}$

19. $\frac{1}{4} + \frac{3}{8}$

20. $\frac{7}{20} + \frac{1}{4}$

21. $\frac{1}{6} + \frac{7}{12}$

A fraction is in lowest terms if both the numerator and the denominator have been divided by all their common factors.

22. List the sums for Exercises 1 to 21 in lowest terms.

Solve.

23. Kelly's mother spent $\frac{1}{4}$ of her time in the grocery store and $\frac{1}{8}$ of her time in the drugstore. How much of her time did she spend in both stores?

24. Kelly's father spent $\frac{1}{3}$ of his time in the grocery store and $\frac{1}{8}$ of his time in the drugstore. How much of his time did he spend in both stores?

25. Kelly spent $\frac{1}{5}$ of her time in the grocery store and $\frac{2}{3}$ of her time in the department store. How much of her time did she spend in both stores?

Add the three fractions.

Example: $\frac{3}{8} + \frac{1}{4} + \frac{5}{16}$

$= \frac{6}{16} + \frac{4}{16} + \frac{5}{16}$, or $\frac{15}{16}$

26. $\frac{1}{3} + \frac{1}{6} + \frac{4}{9}$

27. $\frac{1}{3} + \frac{1}{4} + \frac{1}{12}$

28. $\frac{1}{6} + \frac{1}{4} + \frac{3}{8}$

29. $\frac{1}{3} + \frac{2}{9} + \frac{5}{18}$

30. $\frac{1}{2} + \frac{1}{3} + \frac{1}{12}$

31. $\frac{1}{4} + \frac{3}{8} + \frac{1}{3}$

Can you find a number between

1. $\frac{2}{5}$ and $\frac{4}{5}$?
2. $\frac{1}{4}$ and $\frac{3}{4}$?
3. $\frac{1}{3}$ and $\frac{2}{3}$?
4. $\frac{5}{7}$ and $\frac{6}{7}$?
5. $\frac{1}{4}$ and $\frac{1}{3}$?
6. $\frac{1}{2}$ and $\frac{2}{3}$?
7. $\frac{5}{12}$ and $\frac{2}{5}$?
8. $\frac{9}{10}$ and 1?

PROBLEM SOLVING

Adding Fractions, Regrouping

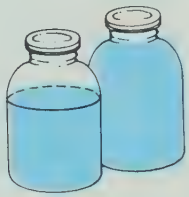
Stuart found two boxes filled with paint bottles.
One box had $1\frac{1}{4}$ bottles of green paint and $3\frac{1}{2}$ bottles of blue paint. The other box had $2\frac{1}{2}$ bottles of green paint and $1\frac{2}{3}$ bottles of blue paint.
How many bottles of green paint were in both boxes?
How many bottles of blue paint were in both boxes?

For the total amount of green paint, add $1\frac{1}{4}$ and $2\frac{1}{2}$.

Write $1\frac{1}{4}$ / $2\frac{1}{2}$ with like denominators. $1\frac{1}{4}$ / $2\frac{2}{4}$ Add fourths. Then add ones. $1\frac{1}{4}$ / $2\frac{2}{4}$ / $3\frac{3}{4}$

There were $3\frac{3}{4}$ bottles of green paint.

For the total amount of blue paint, add $3\frac{1}{2}$ and $1\frac{2}{3}$.



Write $3\frac{1}{2}$ / $1\frac{2}{3}$ with like denominators. $3\frac{3}{6}$ / $1\frac{4}{6}$ Add sixths. Then add ones. $3\frac{3}{6}$ / $1\frac{4}{6}$ / $4\frac{7}{6}$, or $5\frac{1}{6}$

Remember that $\frac{7}{6} = 1\frac{1}{6}$, so $4\frac{7}{6} = 5\frac{1}{6}$.

There were $5\frac{1}{6}$ bottles of blue paint.

Working Together

Regroup the sum so that it has no improper fractions.

1. $2\frac{3}{4}$
   $1\frac{2}{4}$
   $3\frac{5}{4}$

2. $1\frac{1}{2} + 3\frac{1}{2} = 4\frac{2}{2}$

3. $3\frac{6}{7} + 2\frac{5}{7} = 5\frac{11}{7}$

Add. Regroup the sum if it shows an improper fraction.

4. $2\frac{2}{3}$
   $4\frac{2}{3}$

5. $2\frac{3}{5} + 4\frac{2}{5}$

6. $1\frac{5}{6} + \frac{4}{6}$

Find equivalent fractions with like denominators.
Add. Regroup the sum if it shows an improper fraction.

7. $4\frac{1}{2}$
   $3\frac{2}{3}$

8. $2\frac{4}{5}$
   $\frac{3}{4}$

9. $2\frac{1}{3}$
   $4\frac{1}{6}$

10. $1\frac{3}{4} + \frac{3}{12}$

11. $3\frac{4}{9} + 5\frac{2}{3}$

Exercises

Add. Regroup the sum if it shows an improper fraction.

1. $1\frac{2}{3}$
   $2\frac{7}{9}$

2. $5\frac{3}{4}$
   $6\frac{3}{5}$

3. $5\frac{1}{6}$
   $3\frac{11}{12}$

4. $1\frac{5}{6}$
   $\frac{2}{3}$

5. $1\frac{4}{5}$
   $3\frac{7}{10}$

6. $4\frac{1}{4}$
   $3\frac{2}{3}$

7. $2\frac{7}{8} + \frac{3}{4}$

8. $\frac{1}{2} + \frac{3}{5}$

9. $4\frac{5}{8} + 5\frac{5}{6}$

10. $3\frac{3}{4} + 3\frac{1}{2}$

11. $1\frac{1}{2} + 4\frac{1}{2}$

12. $1\frac{1}{6} + 2\frac{8}{9}$

13. $8\frac{2}{3} + \frac{1}{3}$

14. $\frac{3}{8} + 2\frac{7}{12}$

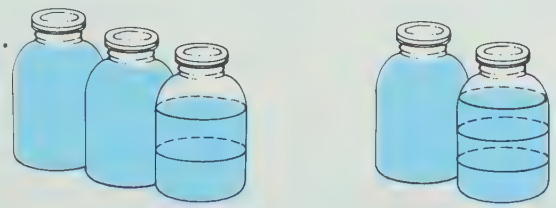
15. $\frac{5}{6} + \frac{7}{12}$

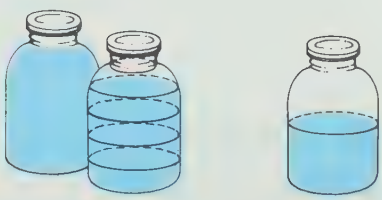
16. $3\frac{1}{6} + 2\frac{3}{4}$

17. $7\frac{7}{10} + 5\frac{3}{10}$

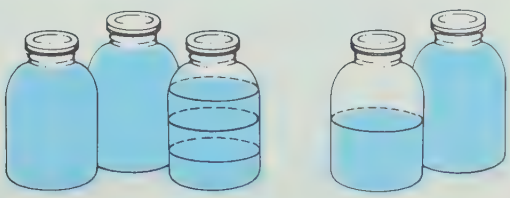
18. $4\frac{5}{12} + \frac{3}{4}$

How much paint will there be when the paint in the bottles in combined?

19. 

20. 

21.

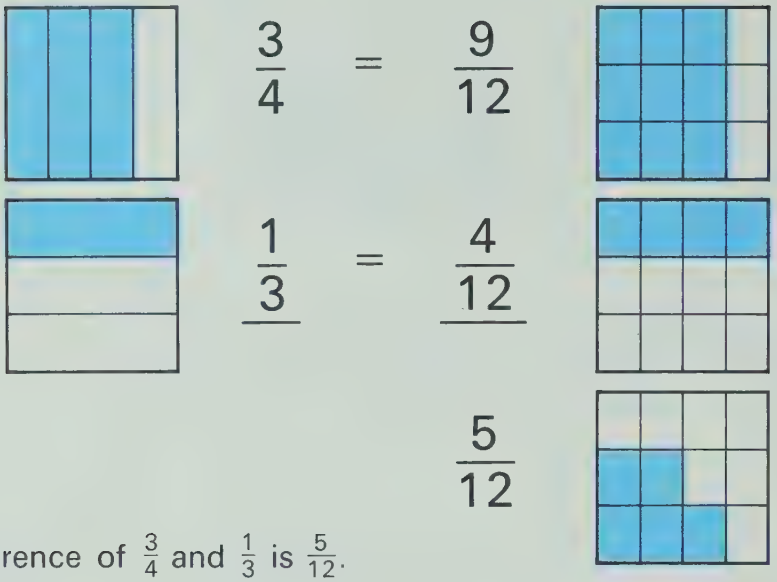
22. 

Subtracting Fractions with Unlike Denominators

Find the difference of $\frac{3}{4}$ and $\frac{1}{3}$.

To subtract fractions with unlike denominators, find equivalent fractions with like denominators. Then subtract the numerators.

Subtract.



$$\frac{3}{4} = \frac{9}{12}$$

$$\frac{1}{3} = \frac{4}{12}$$

$$\frac{5}{12}$$

The difference of $\frac{3}{4}$ and $\frac{1}{3}$ is $\frac{5}{12}$.

To check that $\frac{3}{4} - \frac{1}{3} = \frac{5}{12}$, add $\frac{5}{12}$ and $\frac{1}{3}$.

$$\frac{5}{12} = \frac{5}{12}$$

$$\frac{1}{3} = \frac{4}{12}$$

$$\frac{9}{12}, \text{ or } \frac{3}{4}$$

If this number does not match the first number in the subtraction, there is a mistake in the work.

Working Together

For the pair of fractions in each subtraction, give equivalent fractions that have like denominators.

1. $\frac{5}{6} - \frac{1}{2} = \frac{\blacksquare}{\blacksquare} - \frac{\blacksquare}{\blacksquare}$

2. $\frac{7}{8} - \frac{1}{3} = \frac{\blacksquare}{\blacksquare} - \frac{\blacksquare}{\blacksquare}$

Find equivalent fractions with like denominators. Then subtract. Add to check your work.

3. $\frac{3}{4}$
   $\frac{2}{3}$

4. $\frac{7}{12}$
   $\frac{1}{4}$

5. $\frac{1}{2} - \frac{2}{5}$

6. $\frac{3}{8} - \frac{1}{6}$

Exercises

The students colored the designs they made from a hexagon. Subtract fractions to answer these questions.

1. John has colored $\frac{1}{2}$ of his hexagon. Mani has colored $\frac{1}{3}$ of hers. How much more of the hexagon has John colored?
2. Brian has colored $\frac{5}{6}$ of his hexagon. Sandi has colored $\frac{5}{9}$ of hers. How much more of the hexagon has Brian colored?
3. How much more of the hexagon has Sandi colored than John?
4. How much more of the hexagon has Brian colored than Mani?

Subtract. Add to check.

5. $\frac{1}{2}$ $\underline{\frac{1}{6}}$	6. $\frac{4}{5}$ $\underline{\frac{3}{10}}$	7. $\frac{1}{3}$ $\underline{\frac{1}{4}}$	8. $\frac{9}{10}$ $\underline{\frac{2}{5}}$	9. $\frac{3}{4}$ $\underline{\frac{1}{6}}$	10. $\frac{7}{12}$ $\underline{\frac{1}{3}}$
11. $\frac{3}{8}$ $\underline{\frac{1}{4}}$	12. $\frac{5}{6}$ $\underline{\frac{1}{3}}$	13. $\frac{7}{8}$ $\underline{\frac{2}{3}}$	14. $\frac{2}{3}$ $\underline{\frac{5}{12}}$	15. $\frac{5}{6}$ $\underline{\frac{1}{4}}$	16. $\frac{2}{3}$ $\underline{\frac{1}{2}}$

17. $\frac{7}{9}-\frac{2}{3}$	18. $\frac{9}{10}-\frac{1}{2}$	19. $\frac{3}{4}-\frac{1}{12}$	20. $\frac{2}{3}-\frac{1}{6}$
21. $\frac{1}{2}-\frac{1}{10}$	22. $\frac{9}{20}-\frac{1}{4}$	23. $\frac{2}{3}-\frac{5}{9}$	24. $\frac{4}{5}-\frac{3}{10}$

A fraction is in lowest terms if both the numerator and the denominator have been divided by all their common factors.

25. List the differences for Exercises 5 to 24 in lowest terms.

Subtracting Fractions, Regrouping

The chef in a restaurant had 8 pineapples. After using $2\frac{3}{4}$ pineapples to make pineapple-upside-down cakes, how many pineapples were left?

Subtract $2\frac{3}{4}$ from 8.

For the subtraction $\begin{array}{r} 8 \\ 2\frac{3}{4} \\ \hline \end{array}$ regroup 8 as $7\frac{4}{4}$. $\begin{array}{r} 7\frac{4}{4} \\ 2\frac{3}{4} \\ \hline \end{array}$ Subtract fourths. Then subtract ones. $\begin{array}{r} 7\frac{4}{4} \\ 2\frac{3}{4} \\ \hline 5\frac{1}{4} \end{array}$

There were $5\frac{1}{4}$ pineapples left.

Then, after using $3\frac{1}{2}$ pineapples for a fruit salad, how many pineapples were left?

Subtract $3\frac{1}{2}$ from $5\frac{1}{4}$.

Write $\begin{array}{r} 5\frac{1}{4} \\ 3\frac{1}{2} \\ \hline \end{array}$ with like denominators. $\begin{array}{r} 5\frac{1}{4} \\ 3\frac{2}{4} \\ \hline \end{array}$ Then regroup $5\frac{1}{4}$ as $4\frac{5}{4}$. Subtract fourths. Then subtract ones. $\begin{array}{r} 4\frac{5}{4} \\ 3\frac{2}{4} \\ \hline 1\frac{3}{4} \end{array}$

After making a fruit salad, there were $1\frac{3}{4}$ pineapples left.

Working Together

Regroup $5\frac{1}{5}$ as $4\frac{6}{5}$.
Then subtract.

1. $5\frac{1}{5}$
   $3\frac{4}{5}$

2. $5\frac{1}{5} - 2\frac{2}{5}$

3. $5\frac{1}{5} - \frac{3}{5}$

Regroup 7 as 6 and a fraction.
Then subtract.

4. 7
   $5\frac{3}{8}$

5. $7 - 2\frac{5}{9}$

6. $7 - \frac{7}{12}$

Find equivalent fractions with like denominators.
Regroup the first number if needed. Then subtract.

7. $4\frac{1}{2} - 2\frac{2}{3}$

8. $1\frac{3}{4} - \frac{7}{8}$

9. $6 - 1\frac{4}{5}$

10. $7\frac{1}{6} - 2\frac{11}{12}$

Exercises

Subtract. Add to check.

1. $7\frac{1}{3}$
   $5\frac{7}{9}$

2. $2\frac{1}{2}$
   $1\frac{5}{8}$

3. 8
   $5\frac{1}{4}$

4. $1\frac{1}{3}$
   $\frac{5}{6}$

5. $10\frac{4}{7}$
   $3\frac{3}{4}$

6. $3\frac{4}{9}$
   $1\frac{7}{9}$

7. $7\frac{2}{5} - 3\frac{7}{10}$

8. $9\frac{1}{4} - 1\frac{1}{2}$

9. $3\frac{2}{9} - \frac{2}{3}$

10. $3 - 1\frac{7}{10}$

11. $5\frac{3}{10} - 1\frac{4}{5}$

12. $8\frac{2}{3} - 4\frac{11}{12}$

13. $6\frac{3}{8} - 3\frac{2}{3}$

14. $8\frac{1}{2} - 6\frac{3}{4}$

15. $5 - \frac{5}{12}$

16. $6\frac{4}{12} - 5\frac{3}{4}$

17. $2\frac{5}{8} - \frac{11}{12}$

18. $4\frac{1}{6} - 2\frac{2}{3}$

The chef had 23 apples. He wanted to use $\frac{1}{2}$ of the apples for apple sauce, $\frac{1}{3}$ of the apples for baked apples, and $\frac{1}{8}$ of the apples for tarts.

Instead of cutting the apples, he placed an apple from his own lunch with the 23 apples. Then he made apple sauce with $\frac{1}{2}$ of the 24 apples, baked $\frac{1}{3}$ of the 24 apples, and made tarts with $\frac{1}{8}$ of the 24 apples.

When he had finished cooking, he ate his own lunch, having his apple for dessert.

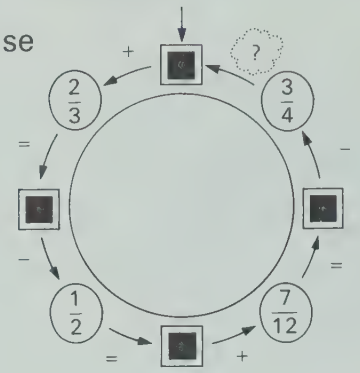
PROBLEM SOLVING

1. What do you think of that?

Practice

Copy this picture or use tracing paper.
Write a fraction of your choice here.

1. Go counterclockwise around the circle. Complete each ■.



2. What should go in ?, <, >, or = ?
3. Choose another fraction and go around the circle again.

Find the sums.

4. $1\frac{2}{7}, 3\frac{4}{7}$
5. $\frac{1}{4}, \frac{3}{4}$
6. $3\frac{5}{8}, 6\frac{7}{8}$
7. $7\frac{3}{5}, 1\frac{4}{5}$
8. $3\frac{2}{3}, \frac{5}{6}$
9. $\frac{3}{4}, 2\frac{7}{12}$
10. $2\frac{5}{6}, 1\frac{3}{4}$
11. $5\frac{4}{5}, 4\frac{7}{10}$

For Exercises 4 to 11,
12. list the sums in lowest terms.

Find the differences.

13. $2\frac{2}{9}, 5\frac{5}{9}$
14. $1, \frac{1}{2}$
15. $3\frac{2}{3}, 5$
16. $7\frac{11}{12}, 7\frac{5}{12}$
17. $3\frac{1}{6}, 1\frac{1}{2}$
18. $6\frac{5}{12}, 5\frac{2}{3}$
19. $1\frac{5}{6}, 7\frac{3}{4}$
20. $2\frac{7}{9}, 3\frac{1}{3}$

For Exercises 13 to 20,
21. list the differences in lowest terms.

Add.

22. $4\frac{1}{10} + \frac{3}{10} + 1\frac{1}{10}$
23. $3\frac{7}{12} + 1\frac{1}{12} + \frac{7}{12}$
24. $1\frac{8}{9} + 1\frac{8}{9} + 1\frac{8}{9}$
25. $\frac{1}{2} + \frac{1}{3} + \frac{1}{4}$
26. $3\frac{1}{2} + 1\frac{2}{5} + 4\frac{1}{10}$
27. $2\frac{3}{4} + 3\frac{1}{2} + 1\frac{5}{8}$

For Exercises 22 to 27,
28. list the sums in lowest terms.

Find the fraction that gives a sum of 1.

29. $\frac{1}{3} + \frac{■}{■} = 1$
30. $\frac{■}{■} + \frac{2}{5} = 1$
31. $\frac{7}{12} + \frac{■}{■} = 1$
32. $\frac{1}{2} + \frac{1}{3} + \frac{■}{■} = 1$
33. $\frac{2}{5} + \frac{■}{■} + \frac{1}{5} = 1$
34. $\frac{■}{■} + \frac{2}{3} + \frac{1}{4} = 1$
35. $\frac{3}{8} + \frac{■}{■} + \frac{1}{6} = 1$
36. $\frac{■}{■} + \frac{1}{6} + \frac{2}{9} = 1$
37. $\frac{1}{4} + \frac{1}{3} + \frac{■}{■} = 1$

A 747 jet airliner takes about 4 h to fly between Toronto and Vancouver.

38. Of the fuel that a 747 *uses* in such a flight, $\frac{1}{5}$ is burned during takeoff. What fraction of the fuel it uses is burned during the rest of the flight?

39. Of the fuel that a 747 uses, about $\frac{3}{16}$ is burned each hour that it cruises. What fraction of the fuel it uses would be burned after it takes off and cruises for an hour?

40. Of the fuel that it uses, about $\frac{1}{5}$ is burned on takeoff and $\frac{3}{4}$ is burned while cruising between Toronto and Vancouver. What fraction of the fuel that it uses is burned during landing?

41. Of the *total amount* of fuel that a 747 can carry, $\frac{1}{14}$ is burned on takeoff. What fraction of its fuel would be left for the rest of the flight?

42. Of the total amount of fuel that a 747 can carry, $\frac{1}{14}$ is burned on takeoff and $\frac{1}{4}$ is burned while cruising between Toronto and Vancouver. What fraction of the fuel would be left when it is ready to land?

43. Between Toronto and Vancouver, a 747 uses $\frac{1}{14}$ of the amount of fuel it can carry on takeoff, $\frac{1}{4}$ of the fuel while cruising, and $\frac{1}{80}$ of the fuel for landing. What fraction of the fuel will it use for the complete flight?

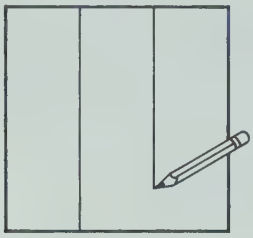
44. On a recent flight, about $\frac{4}{7}$ of the passengers were men, about $\frac{2}{5}$ were women and the rest were children. About what fraction of the passengers were children?

Can you find a simple fraction with a one-digit denominator that is close to the fraction you found in Exercise 43?

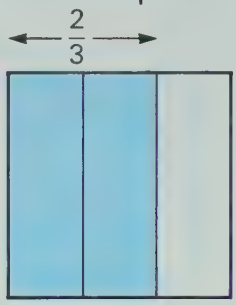
Multiplying Fractions

Melissa made these pictures to show how fractions are multiplied.

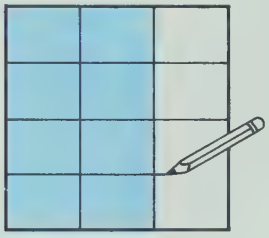
To show $\frac{2}{3}$, she divided a sheet of paper into 3 equal parts.



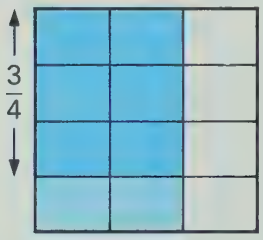
Then she colored 2 of the 3 parts.



To show $\frac{3}{4}$ of $\frac{2}{3}$, she divided the sheet of paper into 4 equal parts.



Then she colored $\frac{3}{4}$ of the $\frac{2}{3}$ darker.



$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$, or $\frac{1}{2}$

Take another look.

For $\frac{3}{4} \times \frac{2}{3}$, multiply numerators. 3×2
Then multiply denominators. 4×3

$$\frac{3}{4} \times \frac{2}{3} = \frac{3 \times 2}{4 \times 3}$$

$$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}, \text{ or } \frac{1}{2}$$

A product of two fractions may not always be in lowest terms.

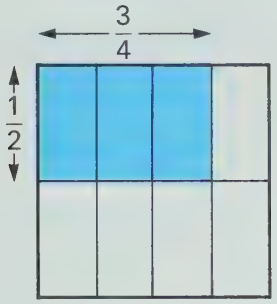
Working Together

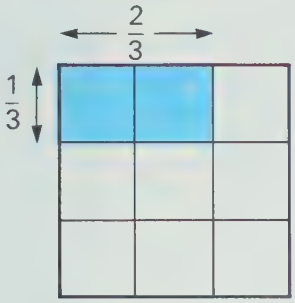
Multiply the numerators.
Then multiply the denominators.

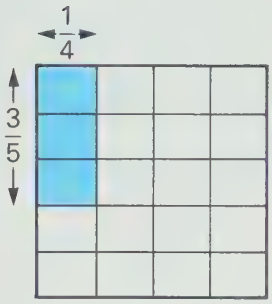
1. $\frac{2}{5} \times \frac{1}{2}$ **2.** $\frac{1}{4} \times \frac{1}{4}$ **3.** $\frac{5}{6} \times \frac{9}{10}$ **4.** $\frac{2}{3} \times \frac{2}{9}$

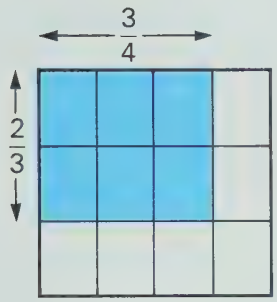
Exercises

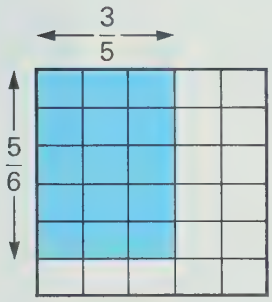
Write a multiplication sentence to match each picture.

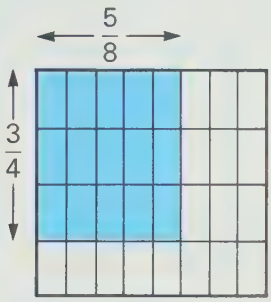
1. 

2. 

3. 

4. 

5. 

6. 

Multiply.

7. $\frac{4}{5} \times \frac{1}{2}$	**8.** $\frac{1}{2} \times \frac{2}{7}$	**9.** $\frac{2}{5} \times \frac{3}{8}$	**10.** $\frac{3}{4} \times \frac{5}{6}$	**11.** $\frac{1}{3} \times \frac{1}{3}$
12. $\frac{2}{3} \times \frac{3}{4}$	**13.** $\frac{5}{7} \times \frac{1}{4}$	**14.** $\frac{4}{9} \times \frac{11}{12}$	**15.** $\frac{5}{6} \times \frac{5}{6}$	**16.** $\frac{3}{5} \times \frac{2}{9}$
17. $\frac{1}{6} \times \frac{2}{7}$	**18.** $\frac{3}{10} \times \frac{2}{3}$	**19.** $\frac{2}{3} \times \frac{5}{12}$	**20.** $\frac{3}{4} \times \frac{3}{8}$	**21.** $\frac{5}{8} \times \frac{2}{5}$
22. $\frac{6}{7} \times \frac{5}{12}$	**23.** $\frac{7}{10} \times \frac{7}{10}$	**24.** $\frac{2}{7} \times \frac{7}{8}$	**25.** $\frac{5}{9} \times \frac{3}{10}$	**26.** $\frac{2}{3} \times \frac{3}{8}$

For Exercises 7 to 26,

27. list the products in lowest terms.

To multiply numbers in mixed form,
first change them to improper fractions.
Then multiply the numerators and the denominators.

Example: For $3\frac{1}{3} \times 2\frac{1}{2}$, use $\frac{10}{3} \times \frac{5}{2} = \frac{50}{6}$, or $8\frac{1}{3}$.

Multiply.

28. $1\frac{1}{2} \times 2\frac{2}{3}$	**29.** $1\frac{5}{6} \times 1\frac{1}{8}$	**30.** $2\frac{1}{3} \times 2\frac{1}{7}$	**31.** $3\frac{1}{2} \times 4\frac{2}{5}$
32. $\frac{2}{3} \times 3\frac{9}{10}$	**33.** $3\frac{3}{4} \times \frac{2}{5}$	**34.** $1\frac{3}{4} \times 4\frac{2}{7}$	**35.** $5\frac{1}{5} \times 2\frac{7}{9}$

Multiplying Fractions and Whole Numbers

On the first day at day camp, the campers were told that they would spend about $\frac{3}{8}$ of the 14 camping days on hikes. About how many camping days would they spend on hikes?

Multiply $\frac{3}{8}$ and 14.

$\frac{3}{8} \times 14 = \frac{3}{8} \times \frac{14}{1}$, or $\frac{42}{8}$

$\frac{42}{8} = 5\frac{2}{8}$, or $5\frac{1}{4}$

About $5\frac{1}{4}$ camping days would be spent on hikes.

On one hike, the lunch ration was $\frac{2}{5}$ of a can of fruit for each hiker. How many cans of fruit would 12 hikers need?

Multiply 12 and $\frac{2}{5}$.

$12 \times \frac{2}{5} = \frac{12}{1} \times \frac{2}{5}$, or $\frac{24}{5}$

$\frac{24}{5} = 4\frac{4}{5}$

The hikers would need $4\frac{4}{5}$ cans of fruit.

The hikers would have to carry 5 cans of fruit.

Working Together

Write the whole number as a fraction with 1 as its denominator. Then multiply.

1. $\frac{2}{3} \times 4$ **2.** $7 \times \frac{4}{5}$ **3.** $\frac{3}{4} \times 16$ **4.** $21 \times \frac{1}{3}$

Exercises

Multiply.

1. $\frac{3}{4} \times 6$	**2.** $16 \times \frac{2}{3}$	**3.** $\frac{1}{5} \times 35$	**4.** $6 \times \frac{4}{9}$	**5.** $\frac{5}{8} \times 2$
6. $7 \times \frac{3}{14}$	**7.** $\frac{3}{5} \times 9$	**8.** $22 \times \frac{1}{2}$	**9.** $\frac{3}{10} \times 12$	**10.** $20 \times \frac{7}{12}$
11. $\frac{1}{4} \times 2$	**12.** $32 \times \frac{3}{8}$	**13.** $\frac{5}{6} \times 24$	**14.** $9 \times \frac{1}{3}$	**15.** $\frac{11}{12} \times 10$

Some products can be written as fractions, whole numbers, or numbers in mixed form.

16. Write any improper fraction as a number in mixed form for the products for Exercises 1 to 15.

17. List the products for Exercises 1 to 15 in lowest terms.

Solve.

18. The campers plan to stay at the camp on $\frac{3}{7}$ of the 14 camping days. On how many camping days will they stay at the camp?

19. The 12 hikers planned to take $\frac{2}{3}$ of a jug of water for each camper. How many jugs of water would they have to carry?

20. The camp kitchen had 5 loaves of bread. The hikers took $\frac{1}{4}$ of the bread. How many loaves of bread did they take?

21. $\frac{1}{2}$ of a box of raisins was packed for each of the 12 hikers. How many boxes of raisins did the hikers take?

Here is another way to find a product in lowest terms.

$$\frac{5}{6} \times \frac{12}{25} = \frac{5 \times 12}{6 \times 25}, \text{ or } \frac{5 \times 2 \times 2 \times 3}{2 \times 3 \times 5 \times 5}$$

the prime factors of the numerator and and the denominator

Divide by the common factors.

$$\frac{\overset{1}{\cancel{5}} \times \overset{1}{\cancel{2}} \times 2 \times \overset{1}{\cancel{3}}}{\underset{1}{\cancel{2}} \times \underset{1}{\cancel{3}} \times \underset{1}{\cancel{5}} \times 5}$$

$\frac{2}{5}$

Write $\frac{5}{6} \times \frac{12}{25} = \frac{2}{5}$

Before multiplying, find the common prime factors in the numerator and the denominator. Divide by them. Write the product in lowest terms.

1. $\frac{1}{2} \times \frac{4}{5}$ **2.** $\frac{4}{9} \times \frac{3}{10}$ **3.** $\frac{8}{15} \times \frac{15}{20}$ **4.** $\frac{6}{12} \times \frac{4}{12}$ **5.** $\frac{9}{10} \times \frac{15}{18}$

try this

Practice

For each out made, the softball pitcher gets credit for pitching $\frac{1}{3}$ of an inning.

1. Early in the season, the pitcher averaged $5\frac{1}{3}$ innings for 11 games. How many innings is that in all?
2. For the whole season, the pitcher averaged $3\frac{2}{3}$ innings for 25 games. How many innings is that in all?

There are 3 outs for each inning pitched.

3. How many outs are there for $5\frac{1}{3}$ innings pitched?
4. How many outs are there for $3\frac{2}{3}$ innings pitched?

Use $>$, $<$, or $=$ to make true statements.

5. $\frac{3}{4} \times \frac{4}{5} \bigcirc \frac{3}{5} \times \frac{2}{3}$
6. $\frac{1}{3} \times 5 \bigcirc 4 \times \frac{1}{2}$
7. $6 \times \frac{4}{9} \bigcirc \frac{1}{5} \times 13$
8. $6 \times \frac{9}{16} \bigcirc 9 \times \frac{3}{8}$
9. $5 \times \frac{3}{4} \bigcirc 7 \times \frac{1}{2}$
10. $\frac{1}{3} \times 2 \bigcirc \frac{7}{8} \times \frac{2}{3}$
11. $\frac{7}{8} \times \frac{5}{7} \bigcirc \frac{1}{12} \times 8$
12. $\frac{3}{5} \times \frac{5}{8} \bigcirc \frac{1}{2} \times \frac{3}{4}$
13. $7 \times \frac{2}{3} \bigcirc \frac{3}{4} \times 6$

KEEPING SHARP

Add, subtract, multiply, or divide. Show your work.

1. 11 745 − 6 778
2. 4967 + 634
3. 5601 × 12
4. 67 212 − 11 564
5. 55 648 ÷ 148
6. 376 + 29 624
7. 30 000 − 24 903
8. 5097 × 78
9. 397 566 ÷ 234
10. 1699 + 1814
11. 3513 × 24
12. 84 312 ÷ 36
13. 2342 × 28
14. 65 576 ÷ 56

Reciprocals

Two numbers whose product is 1 are **reciprocals** of each other.

$\frac{5}{8} \times \frac{8}{5} = \frac{40}{40}$, or 1.

$\frac{5}{8}$ and $\frac{8}{5}$ are reciprocals.

$2\frac{5}{7} \times \frac{7}{19} = \frac{19}{7} \times \frac{7}{19}$, or 1.

$2\frac{5}{7}$ and $\frac{7}{19}$ are reciprocals.

$4 \times \frac{1}{4} = \frac{4}{4}$, or 1.

4 and $\frac{1}{4}$ are reciprocals.

For fractions that are reciprocals, the numerator of one is the same as the denominator of the other.

Working Together

Multiply to find out whether the numbers in each pair are reciprocals.

1. $\frac{3}{4}, \frac{4}{3}$ **2.** $\frac{1}{8}$, 8

3. $1\frac{1}{5}, \frac{5}{6}$ **4.** $\frac{9}{12}, 1\frac{1}{3}$

Find the reciprocal.

Example:

For $\frac{7}{9}$, the reciprocal is $\frac{9}{7}$, or $1\frac{2}{7}$.

Check: $\frac{7}{9} \times 1\frac{2}{7} = \frac{7}{9} \times \frac{9}{7}$, or $\frac{63}{63} = 1$

5. $\frac{3}{5}$ **6.** 5 **7.** $1\frac{1}{2}$

Exercises

Are the numbers in each pair reciprocals?

1. $\frac{2}{5}, \frac{5}{2}$ **2.** $\frac{1}{2}, 1\frac{1}{2}$ **3.** $\frac{1}{6}$, 6 **4.** $3\frac{1}{2}, \frac{2}{7}$

5. $2\frac{2}{5}, \frac{5}{12}$ **6.** $\frac{7}{9}, \frac{9}{7}$ **7.** $3\frac{2}{5}, 5\frac{2}{3}$ **8.** $\frac{8}{12}, 1\frac{1}{2}$

9. $1\frac{3}{4}, \frac{4}{3}$ **10.** 4, $\frac{3}{12}$ **11.** $1\frac{1}{7}, \frac{7}{8}$ **12.** $\frac{2}{9}, 4\frac{1}{2}$

Find the reciprocal for each of these.

13. $\frac{3}{7}$ **14.** $\frac{1}{2}$ **15.** $2\frac{2}{3}$ **16.** $\frac{4}{5}$ **17.** $2\frac{1}{4}$

18. $\frac{7}{12}$ **19.** $1\frac{3}{4}$ **20.** 3 **21.** $\frac{9}{10}$ **22.** $1\frac{1}{5}$

Complete.

23. $1\frac{1}{3} \times \frac{\blacksquare}{\blacksquare} = 1$ **24.** $\frac{7}{10} \times \frac{\blacksquare}{\blacksquare} = 1$ **25.** $7 \times \frac{\blacksquare}{\blacksquare} = 1$

26. $1\frac{4}{5} \times \frac{\blacksquare}{\blacksquare} = 1$ **27.** $5 \times \frac{\blacksquare}{\blacksquare} = 1$ **28.** $\frac{8}{9} \times \frac{\blacksquare}{\blacksquare} = 1$

29. $\frac{1}{9} \times \frac{\blacksquare}{\blacksquare} = 1$ **30.** $3\frac{1}{3} \times \frac{\blacksquare}{\blacksquare} = 1$ **31.** $\frac{1}{6} \times \frac{\blacksquare}{\blacksquare} = 1$

Dividing Fractions

The students have $\frac{2}{3}$ of a jar of paste. Each student needs $\frac{1}{6}$ of a jar of paste for art projects. How many students can make art projects?

Divide $\frac{2}{3}$ by $\frac{1}{6}$.

For $\frac{2}{3} \div \frac{1}{6}$,

multiply $\frac{2}{3} \times \frac{6}{1}$.

Dividing by a number is the same as multiplying by its reciprocal.

$\frac{2}{3} \times \frac{6}{1} = \frac{12}{3}$, or 4

4 students can make art projects.

Here are other examples of dividing with fractions.

Divide $\frac{3}{4}$ by 5.

$\frac{3}{4} \div 5 = \frac{3}{4} \div \frac{5}{1}$

$\frac{3}{4} \div \frac{5}{1} = \frac{3}{4} \times \frac{1}{5}$, or $\frac{3}{20}$

$\frac{3}{4}$ divided by 5 is $\frac{3}{20}$.

Divide 6 by $\frac{4}{5}$.

$6 \div \frac{4}{5} = \frac{6}{1} \div \frac{4}{5}$

$\frac{6}{1} \div \frac{4}{5} = \frac{6}{1} \times \frac{5}{4}$, or $\frac{30}{4}$

$\frac{30}{4} = 7\frac{2}{4}$, or $7\frac{1}{2}$

6 divided by $\frac{4}{5}$ is $7\frac{1}{2}$.

Working Together

Write the reciprocal of each divisor.

1. $\frac{7}{12} \div \frac{2}{3}$
2. $\frac{1}{2} \div \frac{1}{4}$
3. $\frac{1}{6} \div 5$
4. $6 \div \frac{3}{5}$

Replace the divisor with its reciprocal and the symbol $\div$ with the symbol $\times$.

5. $\frac{7}{12} \div \frac{2}{3}$
6. $\frac{1}{2} \div \frac{1}{4}$
7. $\frac{1}{6} \div 5$
8. $6 \div \frac{3}{5}$

Use the reciprocal of the divisor and multiply to find the quotient.

9. $\frac{7}{12} \div \frac{2}{3}$
10. $\frac{1}{2} \div \frac{1}{4}$
11. $\frac{1}{6} \div 5$
12. $6 \div \frac{3}{5}$

Exercises

Divide.

1. $\frac{7}{12} \div \frac{3}{4}$
2. $\frac{5}{6} \div \frac{1}{2}$
3. $\frac{3}{8} \div 3$
4. $2 \div \frac{1}{3}$
5. $\frac{5}{9} \div \frac{5}{7}$
6. $\frac{9}{10} \div \frac{3}{8}$
7. $1 \div \frac{1}{7}$
8. $\frac{3}{4} \div 9$
9. $\frac{1}{2} \div 2$
10. $6 \div \frac{2}{9}$

For Exercises 1 to 10,

11. list the quotients in lowest terms.

Solve.

12. Tom and his 8 friends have $\frac{9}{10}$ of a jar of paste to share equally. How much paste will each student get?
13. Ginger has 3 jars of paste. She needs $\frac{1}{4}$ of a jar of paste for each project. How many projects can she make?

Multiplication can be used to check division.

Example: To check $\frac{4}{5} \div \frac{2}{3} = 1\frac{1}{5}$, multiply $1\frac{1}{5}$ and $\frac{2}{3}$.

If the product does not match the first number in the division, there is a mistake in the work.

Divide. Multiply to check.

14. $\frac{1}{12} \div \frac{1}{3}$
15. $\frac{3}{4} \div 5$
16. $3 \div \frac{3}{5}$
17. $\frac{3}{8} \div \frac{5}{8}$
18. $\frac{3}{4} \div \frac{9}{12}$
19. $8 \div \frac{6}{7}$

Practice

Add. Show each sum in lowest terms.

1. $3\frac{1}{5}+3\frac{2}{5}$
2. $1\frac{3}{8}+\frac{3}{8}$
3. $4\frac{4}{9}+2\frac{2}{9}$
4. $\frac{2}{7}+2\frac{3}{7}$
5. $4\frac{5}{6}+2\frac{5}{6}$
6. $2\frac{1}{4}+3\frac{3}{4}$
7. $6\frac{7}{10}+1\frac{9}{10}$
8. $3\frac{5}{12}+\frac{7}{12}$
9. $\frac{1}{4}+\frac{1}{3}$
10. $1\frac{9}{10}+\frac{3}{5}$
11. $3\frac{3}{10}+1\frac{1}{3}$
12. $2\frac{7}{12}+\frac{3}{8}$
13. $4\frac{2}{3}+2\frac{3}{4}$
14. $3\frac{3}{4}+\frac{1}{2}$
15. $2\frac{7}{8}+7\frac{5}{6}$
16. $\frac{2}{3}+\frac{7}{9}$
17. $\frac{1}{4}+1\frac{5}{6}$
18. $2\frac{2}{3}+2\frac{5}{9}$
19. $1\frac{1}{6}+\frac{7}{12}$
20. $5\frac{3}{4}+6\frac{5}{8}$

Subtract. Show each difference in lowest terms. Add to check.

21. $2\frac{3}{4}-1\frac{1}{4}$
22. $3\frac{5}{6}-3\frac{1}{6}$
23. $1\frac{7}{9}-\frac{4}{9}$
24. $6\frac{11}{12}-3\frac{5}{12}$
25. $4\frac{1}{3}-1\frac{2}{3}$
26. $7-1\frac{5}{8}$
27. $3\frac{1}{5}-2\frac{3}{5}$
28. $5\frac{3}{8}-3\frac{7}{8}$
29. $2\frac{3}{4}-\frac{2}{3}$
30. $1\frac{5}{6}-\frac{1}{2}$
31. $3\frac{7}{10}-3\frac{1}{5}$
32. $4\frac{5}{12}-1\frac{2}{3}$
33. $5\frac{1}{8}-1\frac{3}{4}$
34. $3\frac{2}{5}-2\frac{9}{10}$
35. $9\frac{2}{3}-4\frac{5}{6}$
36. $6\frac{1}{12}-3\frac{1}{4}$
37. $1\frac{1}{2}-\frac{7}{8}$
38. $4\frac{2}{3}-\frac{8}{9}$
39. $3\frac{1}{3}-2\frac{7}{12}$
40. $8\frac{3}{8}-2\frac{1}{2}$

Multiply. Show each product in lowest terms.

41. $\frac{3}{4}\times\frac{1}{2}$
42. $\frac{5}{6}\times\frac{2}{3}$
43. $\frac{5}{8}\times\frac{4}{5}$
44. $\frac{7}{12}\times\frac{4}{7}$
45. $\frac{4}{9}\times\frac{3}{8}$
46. $\frac{7}{10}\times\frac{6}{7}$
47. $\frac{4}{5}\times\frac{5}{6}$
48. $\frac{2}{3}\times\frac{9}{10}$
49. $4\times\frac{1}{6}$
50. $\frac{3}{5}\times 7$
51. $2\times\frac{3}{8}$
52. $\frac{1}{2}\times 3$
53. $\frac{5}{4}\times\frac{2}{5}$
54. $\frac{4}{3}\times\frac{5}{4}$
55. $\frac{11}{6}\times\frac{10}{7}$
56. $\frac{10}{9}\times\frac{9}{10}$
57. $5\frac{1}{3}\times\frac{1}{2}$
58. $6\frac{1}{2}\times\frac{1}{8}$
59. $3\frac{2}{3}\times\frac{1}{6}$
60. $2\frac{5}{6}\times\frac{1}{3}$

Divide. Show each quotient in lowest terms. Multiply to check.

61. $\frac{2}{3}\div 6$
62. $\frac{3}{5}\div 2$
63. $\frac{5}{6}\div 5$
64. $\frac{9}{10}\div 3$
65. $\frac{2}{5}\div 8$
66. $\frac{1}{2}\div 9$
67. $6\div\frac{1}{7}$
68. $10\div\frac{5}{8}$
69. $1\div\frac{5}{6}$
70. $7\div\frac{3}{4}$
71. $4\div\frac{2}{3}$
72. $8\div\frac{6}{7}$
73. $\frac{1}{6}\div\frac{3}{4}$
74. $\frac{4}{5}\div\frac{2}{5}$
75. $\frac{3}{8}\div\frac{1}{2}$
76. $\frac{8}{9}\div\frac{2}{3}$
77. $\frac{1}{2}\div\frac{2}{3}$
78. $\frac{1}{7}\div\frac{3}{7}$
79. $\frac{5}{6}\div\frac{5}{8}$
80. $\frac{2}{3}\div\frac{7}{12}$

$\frac{2}{3}$ of a package of beads is needed to make each bracelet.

81. How many packages of beads are needed for 7 bracelets?

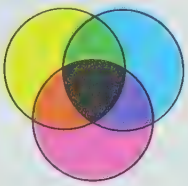
82. How many bracelets can be made with 8 packages of beads?

$\frac{3}{5}$ of a package of nails is needed for each birdhouse.

83. How many packages of nails are needed for 4 birdhouses?

84. How many birdhouses can be made with 6 packages of nails?

The primary colors are red, blue, and yellow. Mixing them in different ways gives other colors.



Sharon has 3 full cans of paint, one red, one blue, and one yellow.

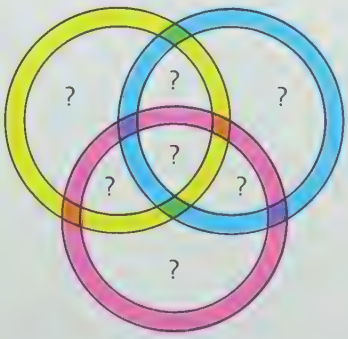
She wants to mix the paint so that

A. all 7 cans will have the same amount of paint when she is finished mixing,

B. she uses equal amounts of paint from two cans when she makes green, orange, or purple, and

C. she uses equal amounts of the red, the blue, and the yellow paint when she makes black.

1. Fill in the diagram with fractions to show how much paint Sharon should use from each can.



Hint: The paint in 3 cans is shared equally among 7 cans. What fraction shows how full each can will be?

PROBLEM SOLVING

Changing Fractions to Decimals

In the first three games between Toronto and Montreal in the 1978 play-off series, the Montreal goalkeeper allowed 8 goals. What was the average number of goals that the Montreal goalkeeper allowed in each game?

The average number of goals allowed in each game could be shown with an improper fraction, $\frac{8}{3}$, or with a number in mixed form, $2\frac{2}{3}$.

$$3\overline{)8} \quad 2 \text{ R2}$$

Often, it is shown as a decimal.

To change $\frac{8}{3}$ to a decimal, divide 8 by 3.

$$\begin{array}{r} 2.666 \\ 3\overline{)8.000} \\ 6 \\ \hline 20 \\ 18 \\ \hline 20 \\ 18 \\ \hline 20 \end{array}$$

The division could continue forever! To round the quotient to two decimal places, look at the digit in the third decimal place. The quotient rounds to 2.67.

The average number of goals that the Montreal goalkeeper allowed in each game was 2.67.

Exercises

Divide the numerator by the denominator to change each fraction to a decimal. Round the quotients to two decimal places.

1. $\frac{1}{3}$	**2.** $\frac{4}{5}$	**3.** $\frac{5}{6}$	**4.** $\frac{7}{12}$	**5.** $\frac{3}{7}$
6. $\frac{5}{8}$	**7.** $\frac{1}{6}$	**8.** $\frac{2}{9}$	**9.** $\frac{11}{12}$	**10.** $\frac{7}{10}$
11. $\frac{23}{10}$	**12.** $\frac{8}{5}$	**13.** $\frac{13}{4}$	**14.** $\frac{39}{8}$	**15.** $\frac{23}{6}$
16. $2\frac{1}{2}$	**17.** $4\frac{2}{3}$	**18.** $1\frac{3}{4}$	**19.** $5\frac{3}{8}$	**20.** $3\frac{5}{12}$

Solve.

21. A goalie allowed 37 goals in 14 games. What is the average number of goals per game that the goalie allowed?

22. Who has the lesser average, a goalie who allowed 144 goals in 45 games or one who allowed 135 goals in 42 games?

23. A basketball team scored 1360 points in 18 games. What is the average number of points scored per game?

24. Which basketball player has the better average, one with 278 points in 12 games or one with 347 points in 15 games?

Baseball batting averages are found by dividing the number of hits by the number of times at bat, and rounding to three decimal places. Here is how some of the Montreal Expos batted during the 1978 season.

	Hits	Times at bat
Carter	136	533
Cash	166	658
Cromartie	180	607
Dawson	154	609
Frias	4	15
Fry	0	9
Garrett	12	69
Herman	7	40
Hutton	12	59

25. Find the batting average of each player.

For some fractions, the digits in the equivalent decimal follow a repeating pattern.

For $\frac{1}{3}$, divide 1 by 3.

$$3\overline{)1.0000\ldots}\quad 0.3333\ldots$$

Write $\frac{1}{3} = 0.\overline{3}$.

Use a bar above the repeating digits to show a decimal for each of these.

1. $\frac{5}{6}$	**2.** $\frac{2}{9}$
3. $1\frac{2}{3}$	**4.** $3\frac{7}{11}$
5. $\frac{8}{15}$	**6.** $\frac{11}{18}$
7. $2\frac{32}{33}$	**8.** $1\frac{4}{9}$

try this

Fractions and Their Equivalent Decimals

Is $\frac{1}{2}+\frac{1}{3}+\frac{1}{4}>1$, or is $\frac{1}{2}+\frac{1}{3}+\frac{1}{4}<1$?

Here is how to answer this question using fractions.

$$\frac{1}{2}+\frac{1}{3}+\frac{1}{4}=\frac{6}{12}+\frac{4}{12}+\frac{3}{12}$$

$$=\frac{13}{12}, \text{ or } 1\frac{1}{12}$$

Here is how to answer this question using decimals.

$$\frac{1}{2}=0.50$$

$$\frac{1}{3}=0.33 \text{ (approximately)}$$

$$\frac{1}{4}=0.25$$

$$\frac{1}{2}+\frac{1}{3}+\frac{1}{4}=1.08 \text{ (approximately)}$$

$$\frac{1}{2}+\frac{1}{3}+\frac{1}{4}>1$$

Exercises

Use decimals with up to two places to complete this chart.

Dividing and rounding to two places can help you with this chart.

	Numerator / Denominator	1	2	3	4	5	6	7	8	9
1.	2	0.5	1	1.5	?	?	?	?	?	?
2.	3	0.33	0.67	?	?	?	?	?	?	?
3.	4	0.25	?	?	?	?	?	?	?	?
4.	5	?	?	?	?	?	?	?	?	?
5.	6	?	?	?	?	?	?	?	?	?
6.	7	?	?	?	?	?	?	?	?	?
7.	8	?	?	?	?	?	?	?	?	?
8.	9	?	?	?	?	?	?	?	?	?
9.	10	?	?	?	?	?	?	?	?	?

For this chart,

10. what patterns can you find?

Use $>$, $<$, or $=$ to make true statements.

Decimals can help you with most of these.

11. $\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\frac{1}{6}$ ◯ 1

12. $\frac{1}{4}+\frac{1}{5}+\frac{1}{6}+\frac{1}{7}+\frac{1}{8}$ ◯ 1

13. $\frac{1}{3}+\frac{1}{2}+\frac{3}{4}$ ◯ $\frac{3}{8}+\frac{1}{4}+\frac{2}{3}$

14. $1\frac{3}{4}-\frac{1}{5}$ ◯ $\frac{3}{4}+\frac{4}{5}$

15. $\frac{1}{2}\times\frac{4}{5}$ ◯ 1

16. $\frac{1}{2}\times\frac{2}{3}\times\frac{3}{4}\times\frac{4}{5}\times\frac{5}{6}$ ◯ $\frac{1}{6}$

List in order from least to greatest.

Try using decimals.

17. $\frac{1}{2}, \frac{3}{8}, \frac{2}{3}, \frac{4}{9}, \frac{3}{4}, \frac{2}{5}$

18. $\frac{4}{5}, \frac{7}{10}, \frac{5}{6}, \frac{5}{7}, \frac{3}{4}, \frac{7}{9}$

Add the fractions. Then add the equivalent decimals. Compare the results.

19. $2\frac{1}{2}$ + $1\frac{3}{4}$

20. $3\frac{2}{5}$ + $\frac{1}{2}$

21. $4\frac{1}{4}$ + $2\frac{5}{8}$

22. $3\frac{2}{3}$ + $3\frac{7}{9}$

23. $1\frac{3}{10}$ + $2\frac{4}{5}$

24. $1\frac{1}{2}$ + $2\frac{3}{8}$

Subtract the fractions. Then subtract the equivalent decimals. Compare the results.

25. $2\frac{1}{10}$ − $\frac{1}{2}$

26. $7\frac{1}{4}$ − $5\frac{1}{8}$

27. $3\frac{8}{9}$ − $2\frac{2}{3}$

28. $1\frac{1}{2}$ − $\frac{5}{6}$

29. $4\frac{2}{5}$ − $2\frac{9}{10}$

30. $7\frac{1}{6}$ − $3\frac{1}{2}$

Multiply the fractions. Then multiply the equivalent decimals. Compare the results.

31. $\frac{1}{4}\times\frac{1}{2}$

32. $\frac{2}{3}\times\frac{3}{4}$

33. $\frac{4}{5}\times\frac{1}{4}$

34. $\frac{3}{8}\times\frac{2}{3}$

35. $\frac{3}{5}\times\frac{5}{9}$

36. $\frac{1}{2}\times\frac{4}{5}$

Divide the fractions. Then divide the equivalent decimals. Compare the results.

37. $\frac{3}{8}\div 3$

38. $\frac{4}{9}\div 2$

39. $\frac{1}{2}\div 5$

40. $\frac{8}{9}\div 4$

41. $\frac{2}{3}\div 6$

42. $\frac{4}{5}\div 8$

Add.

$\frac{1}{3}$	$0.333\cdots$	$0.\overline{3}$
$\frac{1}{3}$	$0.333\cdots$	$0.\overline{3}$
$\frac{1}{3}$	$0.333\cdots$	$0.\overline{3}$
$\frac{3}{3}$, or 1	$0.999\cdots$	$0.\overline{9}$

Since the addends are equal, the sums are equal.

$1 = 0.\overline{9}$

1. Do you agree?

try this

Fractions on a Calculator

On a calculator, a decimal can be used in place of a fraction. Divide the numerator by the denominator to find the decimal.

For $\frac{1}{2}$, press 1 ÷ 2 = .

The display will show

$\frac{1}{2}$ as .

For a fraction, a calculator can show the *exact* equivalent decimal, or . . .

For $\frac{17}{3}$, press 17 ÷ 3 = .

The display will show

$\frac{17}{3}$ as .

. . . the calculator shows a decimal that is *close* to the equivalent decimal.

Complete.

1. For $\frac{3}{4}$, press 3 ÷ 4 = .

The display will show

$\frac{3}{4}$ as [?] .

2. For $\frac{2}{5}$, press 2 ÷ 5 = .

The display will show

$\frac{2}{5}$ as [?] .

3. For $\frac{13}{2}$, press ▒ ÷ ▒ = .

The display will show

$\frac{13}{2}$ as [?] .

4. For $\frac{3}{8}$, press ▒ ÷ ▒ = .

The display will show

$\frac{3}{8}$ as [?] .

5. For $\frac{1}{3}$, press ▒ ÷ ▒ = .

The display will show

$\frac{1}{3}$ as [?] .

6. For $\frac{9}{4}$, press ▒ ÷ ▒ = .

The display will show

$\frac{9}{4}$ as [?] .

7. For $\frac{7}{10}$, press ▒ ÷ ▒ = .

The display will show

$\frac{7}{10}$ as [?] .

8. For $\frac{29}{8}$, press ▒ ÷ ▒ = .

The display will show

$\frac{29}{8}$ as [?] .

9. For $\frac{2}{9}$, press ▒ ÷ ▒ = .

The display will show

$\frac{2}{9}$ as [?] .

Calculator

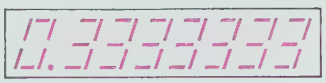
A calculator can display a number in different ways.

For $2 \times \frac{1}{6}$,

use		The display will show
	2	
×		2.
	1	
÷		2.
	6	
=		0.333333333

For $\frac{1}{6} \times 2$,

use		The display will show
	1	
÷		1.
	6	
×		0.166666666
	2	
=		0.333333332

On a calculator,  may represent $\frac{1}{3}$.

On a calculator, may represent $\frac{1}{3}$.

What will the display show after each = ?

10. $3 \times \frac{1}{3}$ ∴ 1

Use 3 × 1 ÷ 3 = .

11. $\frac{1}{3} \times 3$ ∴ 1

Use 1 ÷ 3 × 3 = .

12. $3 \times \frac{2}{3}$

Use 3 × 2 ÷ 3 = .

13. $\frac{2}{3} \times 3$

Use 2 ÷ 3 × 3 = .

14. $6 \times \frac{7}{9}$

Use 6 × 7 ÷ 9 = .

15. $\frac{7}{9} \times 6$

Use 7 ÷ 9 × 6 = .

16. $9 \times \frac{1}{12}$

Use 9 × 1 ÷ 12 = .

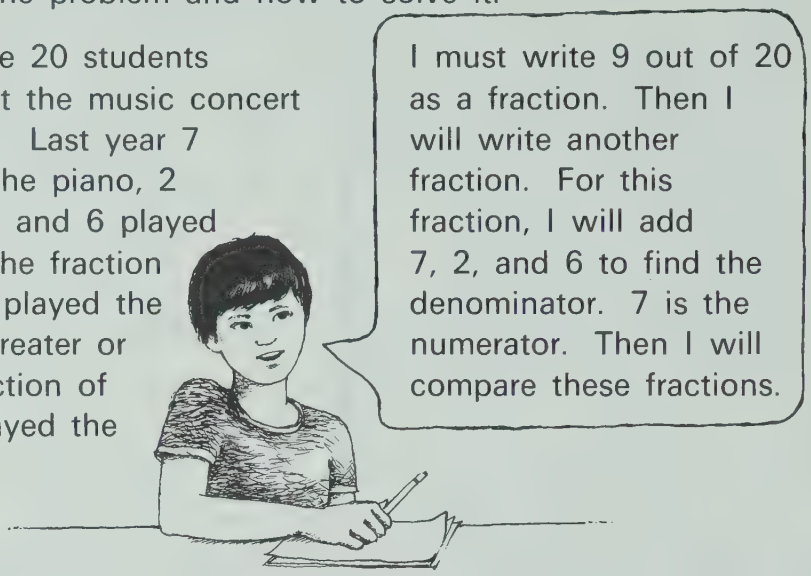
17. $\frac{1}{12} \times 9$

Use 1 ÷ 12 × 9 = .

Restating a Problem in Your Own Words

Sometimes stating a problem in your own words can help you understand the problem and how to solve it.

This year 9 of the 20 students who performed at the music concert played the piano. Last year 7 students played the piano, 2 played the violin, and 6 played the trumpet. Is the fraction of students who played the piano this year greater or less than the fraction of students who played the piano last year?


I must write 9 out of 20 as a fraction. Then I will write another fraction. For this fraction, I will add 7, 2, and 6 to find the denominator. 7 is the numerator. Then I will compare these fractions.

Write each of these problems in your own words. Then solve the problem.

1. Pam, Paul, and Pat agreed to sell 100 tickets together. After they had sold $\frac{1}{10}$ of them, they each took the same number of the remaining tickets to sell. How many tickets did each take?

2. Last year $\frac{5}{8}$ of the 32 students in Sally's class worked on the music concert. Half of them played an instrument. How many students in Sally's class played an instrument for the concert?

3. Sam bought two jars of paint of the same size, one with purple paint and the other with blue. He used $\frac{3}{4}$ of the purple paint and $\frac{2}{5}$ of the blue paint. He then poured the remainder of the blue paint into the jar of purple paint. How full was the jar?

4. Four students made the background for the first part of the concert. They used $1\frac{1}{2}$ rolls of mural paper. Three other students used $2\frac{2}{3}$ rolls of mural paper for the background for the last part of the concert. How many rolls of mural paper did they have to take from the school stockroom?

PROBLEM SOLVING

Checking Up

Add. Show each sum in lowest terms.

1. $\frac{1}{7} + \frac{4}{7}$ **2.** $\frac{5}{12} + \frac{3}{12}$ **3.** $3\frac{2}{9} + 1\frac{4}{9}$ **4.** $2\frac{2}{5} + 5\frac{2}{5}$

5. $\frac{3}{4} + \frac{3}{4}$ **6.** $\frac{5}{8} + \frac{3}{8}$ **7.** $1\frac{7}{10} + 2\frac{9}{10}$ **8.** $4\frac{2}{3} + 5\frac{2}{3}$

9. $\frac{1}{3} + \frac{3}{8}$ **10.** $\frac{1}{4} + \frac{1}{6}$ **11.** $3\frac{3}{7} + 1\frac{2}{5}$ **12.** $1\frac{2}{9} + 2\frac{7}{12}$

13. $\frac{1}{2} + \frac{5}{6}$ **14.** $\frac{3}{4} + \frac{5}{8}$ **15.** $3\frac{4}{5} + 6\frac{2}{3}$ **16.** $5\frac{5}{12} + 1\frac{7}{8}$

Subtract. Show each difference in lowest terms.

17. $\frac{4}{5} - \frac{2}{5}$ **18.** $\frac{7}{8} - \frac{3}{8}$ **19.** $3\frac{5}{6} - 2\frac{1}{6}$ **20.** $4\frac{7}{12} - 1\frac{5}{12}$

21. $2\frac{1}{3} - 1\frac{2}{3}$ **22.** $7\frac{3}{10} - 2\frac{8}{10}$ **23.** $2 - \frac{1}{4}$ **24.** $7 - \frac{7}{9}$

25. $\frac{1}{2} - \frac{1}{5}$ **26.** $\frac{8}{9} - \frac{5}{6}$ **27.** $4\frac{5}{7} - 4\frac{1}{2}$ **28.** $5\frac{7}{8} - 3\frac{7}{12}$

29. $8\frac{1}{3} - 3\frac{7}{9}$ **30.** $3\frac{1}{4} - 2\frac{5}{6}$ **31.** $5\frac{3}{10} - 1\frac{4}{5}$ **32.** $1\frac{1}{6} - \frac{2}{3}$

Multiply. Show each product in lowest terms.

33. $\frac{1}{2} \times \frac{1}{4}$ **34.** $\frac{2}{3} \times \frac{3}{8}$ **35.** $\frac{4}{5} \times \frac{1}{6}$ **36.** $\frac{7}{8} \times \frac{3}{4}$

37. $\frac{4}{9} \times \frac{5}{6}$ **38.** $\frac{4}{7} \times \frac{7}{12}$ **39.** $\frac{3}{5} \times 7$ **40.** $2 \times \frac{3}{4}$

41. $\frac{1}{2} \times 5$ **42.** $20 \times \frac{7}{10}$ **43.** $6 \times 3\frac{1}{3}$ **44.** $3 \times 1\frac{2}{7}$

45. $2\frac{3}{8} \times 8$ **46.** $4\frac{5}{12} \times 4$ **47.** $\frac{7}{8} \times 2\frac{2}{7}$ **48.** $\frac{5}{9} \times 2\frac{2}{5}$

Find the reciprocals.

49. $\frac{3}{8}$ **50.** 4 **51.** $1\frac{2}{3}$

Complete.

52. $\frac{3}{4} \times \frac{\blacksquare}{\blacksquare} = 1$ **53.** $7 \times \frac{\blacksquare}{\blacksquare} = 1$

Divide. Show each quotient in lowest terms.

54. $\frac{4}{5} \div 4$ **55.** $\frac{1}{3} \div 2$ **56.** $\frac{6}{7} \div 8$ **57.** $\frac{3}{4} \div 5$

58. $1 \div \frac{1}{9}$ **59.** $6 \div \frac{3}{8}$ **60.** $3 \div \frac{3}{4}$ **61.** $9 \div \frac{3}{5}$

62. $\frac{5}{6} \div \frac{5}{8}$ **63.** $\frac{7}{10} \div \frac{3}{8}$ **64.** $\frac{4}{9} \div \frac{2}{3}$ **65.** $\frac{1}{2} \div \frac{5}{6}$

Write a decimal with up to two places for each fraction.

66. $\frac{1}{2}$ **67.** $\frac{3}{4}$ **68.** $\frac{9}{10}$ **69.** $\frac{2}{5}$ **70.** $\frac{3}{12}$ **71.** $\frac{6}{8}$

72. $\frac{2}{3}$ **73.** $\frac{4}{9}$ **74.** $\frac{7}{8}$ **75.** $\frac{5}{6}$ **76.** $\frac{5}{12}$ **77.** $\frac{1}{7}$

12 RATIO

Writing Ratios

For every two turns
of the pedals on this bicycle,
the rear wheel turns five times.

The **ratio** of turns of the pedals
to turns of the rear wheel is 2 to 5

A ratio is
the comparison of
two like quantities.

A ratio can be
shown with a colon. 2 : 5

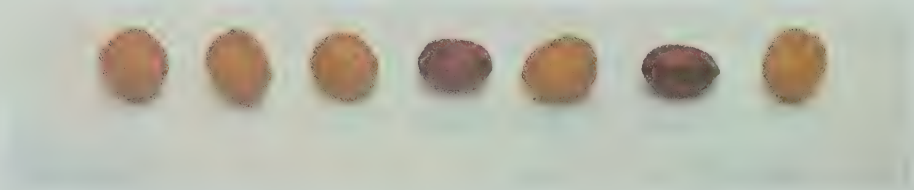
A ratio can be
shown as a fraction. $\frac{2}{5}$

Working Together

What is being compared?

1. 1 to 3 **2.** $\frac{3}{9}$ **3.** 5 : 1 **4.** 5 out of 9

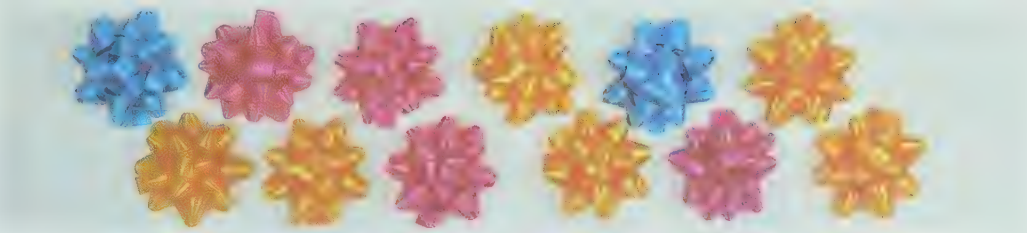
Give each ratio in three different ways.



5. walnuts to pecans
6. pecans to walnuts
7. walnuts to all the nuts
8. pecans to all the nuts

Exercises

What is being compared?



1. 6 out of 12 **2.** 6 : 4 **3.** $\frac{2}{12}$ **4.** 4 to 2

Write each ratio in three different ways.

5. gold bows to blue bows

6. blue bows to gold bows

7. pink bows to all the bows

8. pink bows to gold bows

Write ratios for each of these in two other ways.

9. 2 of every 9 bicycles needed their brakes fixed.

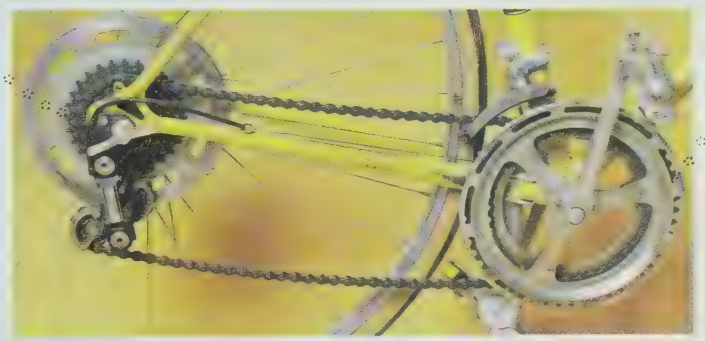
10. 31 of every 100 bicycles sold were ten-speed bicycles.

11. The ratio of red bicycles to green bicycles was $\frac{7}{3}$.

12. The ratio of new bicycles to used bicycles was 4 : 7.

On a ten-speed bicycle, there are two gear wheels at the pedals and five gear wheels on the back axle.

20 teeth



40 teeth

1. For the gear in the picture, for every 20 turns of the pedals, the rear wheel turns 40 times. Explain.

The other back gear wheels have 28, 24, 17, and 14 teeth. The other front gear wheel has 52 teeth.

2. Write the ratio of pedal turns to rear wheel turns for the other nine gears.

PROBLEM SOLVING

Finding Equivalent Ratios

For this vending machine, past sales have shown that the ratio of the amount of white milk sold to the amount of chocolate milk sold is 3 to 2.

$\frac{3}{2} = \frac{3 \times 2}{2 \times 2} = \frac{6}{4}$

$\frac{3}{2} = \frac{3 \times 3}{2 \times 3} = \frac{9}{6}$

$\frac{3}{2} = \frac{3 \times 4}{2 \times 4} = \frac{12}{8}$

$\frac{3}{2}$, $\frac{6}{4}$, $\frac{9}{6}$, and $\frac{12}{8}$ are **equivalent ratios.**

Multiplying both numbers in a ratio by the same number gives an equivalent ratio.

3 out of every 6 of the cartons that fill the machine contain white milk. The ratio of the number of cartons of white milk to the total number of cartons is 3 to 6.

$\frac{3}{6} = \frac{3 \div 3}{6 \div 3} = \frac{1}{2}$

$\frac{3}{6}$ and $\frac{1}{2}$ are equivalent ratios.

$\frac{1}{2}$ is the **simplest form** for $\frac{3}{6}$.

Dividing both numbers in a ratio by the same number gives an equivalent ratio.

When the two numbers in a ratio are whole numbers and they have no common factor greater than 1, the ratio is in simplest form.

Working Together

Complete.

1. $\frac{2}{5} = \frac{\blacksquare}{\blacksquare}$ (2 × 3, 5 × 3)

2. $\frac{8}{6} = \frac{\blacksquare}{\blacksquare}$ (8 × 2, 6 × 2)

Multiply both numbers in each ratio by 4 to find equivalent ratios.

3. $\frac{1}{6}$ **4.** 12:4

Complete.

5. $\frac{4}{14} = \frac{\blacksquare}{\blacksquare}$ (4 ÷ 2, 14 ÷ 2)

6. $\frac{30}{45} = \frac{\blacksquare}{\blacksquare}$ (30 ÷ 5, 45 ÷ 5)

Divide both numbers in each ratio by 3 to find equivalent ratios.

7. 6:9 **8.** $\frac{18}{15}$

Find three ratios equivalent to each.

9. $\frac{1}{4}$ **10.** 8:10

Give each of these ratios in simplest form.

11. 9:12 **12.** 25:100

Exercises

Write three ratios equivalent to each.

1. $\frac{1}{5}$ **2.** 5:2 **3.** $\frac{3}{8}$ **4.** 2:12 **5.** $\frac{15}{3}$ **6.** $\frac{7}{10}$

Divide the numbers in each ratio by a common factor to get an equivalent ratio.

Ring the ratios you get that are in simplest form.

7. $\frac{8}{10}$ **8.** 16:6 **9.** $\frac{300}{100}$ **10.** 3:12 **11.** $\frac{35}{45}$ **12.** $\frac{60}{24}$

Write each in simplest form.

13. $\frac{20}{25}$ **14.** 14:2 **15.** $\frac{10}{6}$ **16.** 27:21 **17.** $\frac{8}{12}$ **18.** 50:100

Complete this **ratio table** for the vending machine.

19.

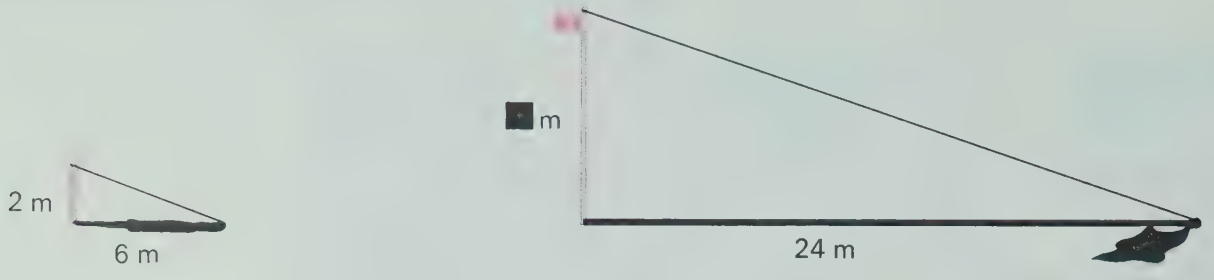
		× 2	× 3	× 4	× 5	× 6
Cartons of white milk	3	6	?	?	?	?
Cartons of chocolate milk	2	4	?	?	?	?

For the vending machine, make ratio tables comparing

20. the number of cartons of each kind of drink with the total number of cartons.

Finding the Missing Term

Geometric figures that have the same shape are similar. For similar figures, the ratios of the lengths of matching sides are equivalent.



The two triangles shown in the picture are similar.

The ratio of the length of the pole's shadow to the length of the person's shadow is $\frac{24}{6}$.

The ratio of the height of the pole to the height of the person is $\frac{\blacksquare}{2}$.

The ratios

$$\frac{\text{length of pole's shadow}}{\text{length of person's shadow}} \text{ and } \frac{\text{height of pole}}{\text{height of person}} \text{ are equivalent.}$$

To find the real height of the pole,

write $\frac{24}{6} = \frac{\blacksquare}{2}$.

To find the missing term,

think $6 \rightarrow 2$: $6 \div 3$

Then divide 24 by 3.

$$\frac{24}{6} \overset{24 \div 3}{=} \frac{8}{2} \quad (6 \div 3)$$

The real height of the pole is 8 m.

Here is an example of finding the missing term by multiplication.

$$\frac{3}{4} = \frac{15}{\blacksquare}$$

To find the missing term,

think $3 \rightarrow 15$: 3×5

Then multiply 4 by 5.

$$\frac{3}{4} \overset{3 \times 5}{=} \frac{15}{20} \quad (4 \times 5)$$

Working Together

Complete each of these.

1. $\frac{3}{4} = \frac{6}{\blacksquare}$ (3 × 2; 4 × 2)

2. $\frac{9}{6} = \frac{\blacksquare}{18}$ (9 × ?; 6 × 3)

3. $\frac{2}{5} = \frac{20}{\blacksquare}$ (2 × ?; 5 × ?)

4. $\frac{15}{10} = \frac{\blacksquare}{100}$

5. $\frac{16}{8} = \frac{2}{\blacksquare}$ (16 ÷ 8; 8 ÷ 8)

6. $\frac{3}{21} = \frac{\blacksquare}{7}$ (3 ÷ ?; 21 ÷ 3)

7. $\frac{25}{10} = \frac{5}{\blacksquare}$ (25 ÷ ?; 10 ÷ ?)

8. $\frac{12}{9} = \frac{\blacksquare}{3}$

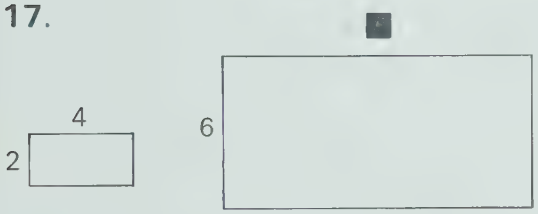
Exercises

Find the value for ■ that makes the ratios equivalent.

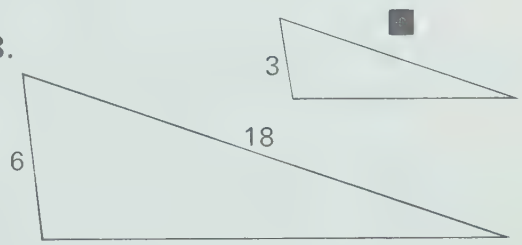
1. $\frac{7}{10} = \frac{\blacksquare}{20}$
2. $\frac{8}{32} = \frac{1}{\blacksquare}$
3. $\frac{2}{3} = \frac{\blacksquare}{27}$
4. $\frac{42}{7} = \frac{6}{\blacksquare}$
5. $\frac{12}{10} = \frac{120}{\blacksquare}$
6. $\frac{27}{18} = \frac{\blacksquare}{2}$
7. $\frac{6}{9} = \frac{30}{\blacksquare}$
8. $\frac{20}{100} = \frac{\blacksquare}{10}$
9. $\frac{33}{24} = \frac{\blacksquare}{8}$
10. $\frac{3}{4} = \frac{\blacksquare}{100}$
11. $\frac{9}{4} = \frac{54}{\blacksquare}$
12. $\frac{24}{30} = \frac{4}{\blacksquare}$
13. $\frac{75}{50} = \frac{15}{\blacksquare}$
14. $\frac{3}{1} = \frac{\blacksquare}{4}$
15. $\frac{3}{5} = \frac{60}{\blacksquare}$
16. $\frac{20}{24} = \frac{\blacksquare}{6}$

The figures in each pair are similar.
Find the value of ■ for each figure.

17.



18.



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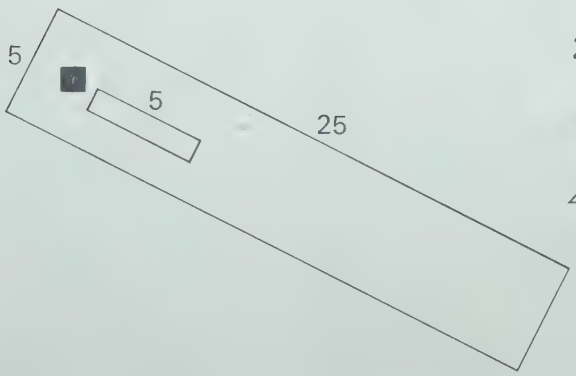


20.

Finding the Missing Term Using Cross Products

The contest rules say that there will be 3 winning entries for every 8 entries.

There were 5832 entries.
How many winning entries will there be?

The ratio of winning entries to total entries will be $\frac{3}{8}$.

To find how many of the 5832 entries will be winners, write

$$\frac{3}{8} = \frac{\blacksquare}{5832}$$

and use cross products.

$$\begin{array}{rcl} 3 & \quad & \blacksquare \\ & = & \\ 8 & \quad & 5832 \end{array} \quad \begin{array}{l} \longrightarrow 8 \times \blacksquare \\ \\ \longrightarrow 3 \times 5832 \end{array}$$

$$8 \times \blacksquare = 3 \times 5832$$

$$8 \times \blacksquare = 17\,496$$

$$17\,496 \div 8 = 2187$$

$$8 \times 2187 = 17\,496$$

The number of winning entries will be 2187.

Working Together

Write a sentence showing equal cross products.

Example: For $\frac{5}{7} = \frac{\blacksquare}{28}$, write $7 \times \blacksquare = 5 \times 28$.

1. $\frac{4}{3} = \frac{32}{\blacksquare}$
2. $\frac{8}{10} = \frac{\blacksquare}{100}$

Find the missing term.

Example:

For $6 \times \blacksquare = 5 \times 18$, or 90, you can divide 90 by 6 to find a value for $\blacksquare$.

3. $5 \times \blacksquare = 7 \times 20$
4. $\frac{9}{6} = \frac{\blacksquare}{26}$

Exercises

Use cross products to find the missing term.

1. $\frac{4}{14} = \frac{6}{\blacksquare}$
2. $\frac{21}{6} = \frac{\blacksquare}{10}$
3. $\frac{6}{40} = \frac{15}{\blacksquare}$
4. $\frac{13}{8} = \frac{\blacksquare}{24}$
5. $\frac{14}{12} = \frac{35}{\blacksquare}$
6. $\frac{26}{24} = \frac{\blacksquare}{36}$
7. $\frac{45}{75} = \frac{60}{\blacksquare}$
8. $\frac{26}{8} = \frac{\blacksquare}{36}$
9. $\frac{18}{30} = \frac{21}{\blacksquare}$
10. $\frac{72}{80} = \frac{\blacksquare}{100}$
11. $\frac{5}{15} = \frac{6}{\blacksquare}$
12. $\frac{24}{9} = \frac{\blacksquare}{12}$
13. $\frac{9}{12} = \frac{30}{\blacksquare}$
14. $\frac{66}{60} = \frac{\blacksquare}{100}$
15. $\frac{2}{16} = \frac{7}{\blacksquare}$

Solve.

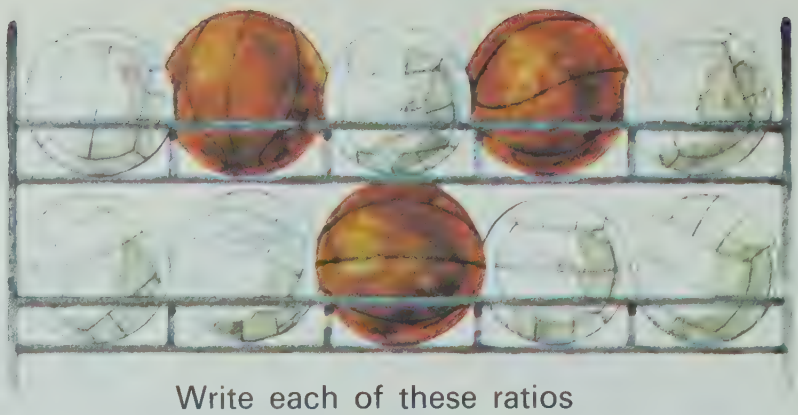
16. There were 5832 entries in the contest. If there had been 168 more, how many winning entries would there have been?
17. How many more entries were needed for there to have been 2400 winning entries?
18. 5 of every 9 entries were from women. How many of the 5832 entries were from women?
*19. 7 of every 12 entries came from Ontario. How many entries came from outside Ontario?

Add, subtract, multiply, or divide.

1. 9.7 + 0.825	2. 2.9 × 5.4	3. 6.575 − 3.8
4. 69.56 ÷ 4	5. 6.09 + 16	6. 107.8 ÷ 35
7. 11.4 − 9.47	8. 4.7 × 0.38	9. 5 − 1.2
10. 5.582 + 5.93	11. 45.5 ÷ 28	12. 2.06 × 3.86
13. 0.07 × 0.19	14. 1.96 ÷ 7	
15. 10 − 3.05	16. 1.49 + 0.5717	

KEEPING SHARP

Practice



Give a ratio for

1. volleyballs to basketballs.
2. basketballs to volleyballs.
3. basketballs to all the balls.
4. volleyballs to all the balls.

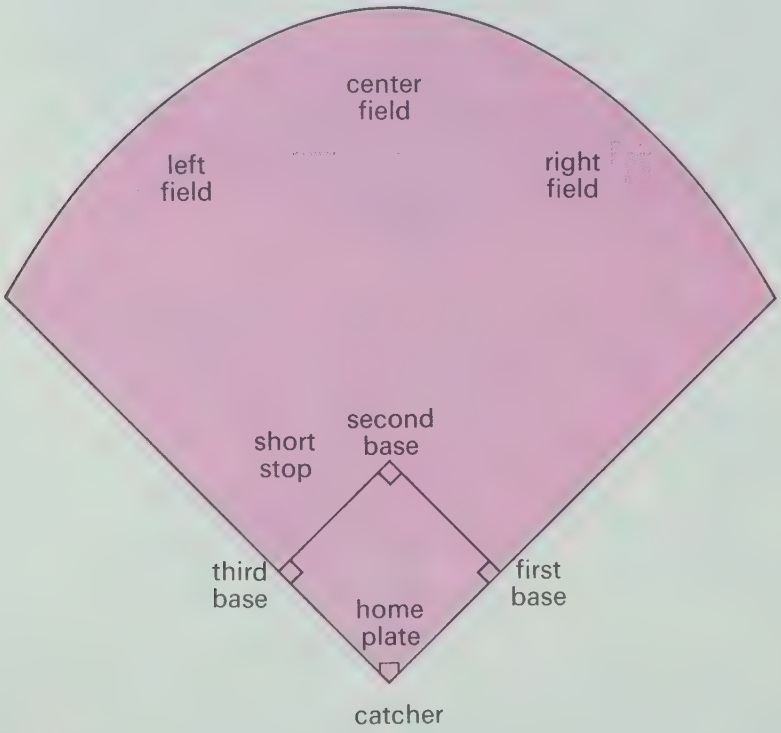
Write five ratios that are equivalent to each of these.

5. $\frac{15}{25}$ **6.** 6:4 **7.** $\frac{3}{18}$

Write each of these ratios in simplest form.

8. 8:12 **9.** $\frac{75}{100}$ **10.** 24:8

There are 9 positions on a baseball field.



3 are outfield positions.

6 are infield positions.

Write a ratio for each of these.

11. outfield positions to infield positions

12. infield positions to outfield positions

13. outfield positions to all the positions

14. infield positions to all the positions

The baseball diamond above is drawn with a scale ratio of 1 cm to 15 m.

15. About how far is it from home plate to second base on the real diamond?

16. About how far is it from home plate to first base on the real diamond?

17. About how far is it around the real diamond?

***18.** About how far is it from home plate to the outfield fence on the real field?

Find the value for ■ that makes the ratios equivalent.

19. $\frac{25}{10} = \frac{■}{14}$ **20.** $\frac{3}{6} = \frac{50}{■}$ **21.** $\frac{27}{21} = \frac{■}{49}$ **22.** $\frac{5}{30} = \frac{4}{■}$ **23.** $\frac{54}{18} = \frac{■}{27}$

24. $\frac{14}{8} = \frac{■}{12}$ **25.** $\frac{25}{100} = \frac{■}{4}$ **26.** $\frac{15}{40} = \frac{9}{■}$ **27.** $\frac{45}{40} = \frac{■}{48}$ **28.** $\frac{49}{70} = \frac{■}{100}$

29. $\frac{33}{30} = \frac{■}{40}$ **30.** $\frac{6}{9} = \frac{14}{■}$ **31.** $\frac{38}{24} = \frac{■}{36}$ **32.** $\frac{36}{60} = \frac{■}{100}$ **33.** $\frac{21}{9} = \frac{■}{15}$

34. $\frac{10}{25} = \frac{14}{■}$ **35.** $\frac{24}{12} = \frac{■}{18}$ **36.** $\frac{33}{15} = \frac{22}{■}$ **37.** $\frac{10}{14} = \frac{■}{63}$ **38.** $\frac{9}{30} = \frac{■}{100}$

Sometimes ratios will use decimals.

Example: For $\frac{1.2}{3} = \frac{■}{2}$, write $3 \times ■ = 1.2 \times 2$, or 2.4.
Then divide 2.4 by 3 to find the value for ■.

Find the value for ■ that makes the ratios equivalent.

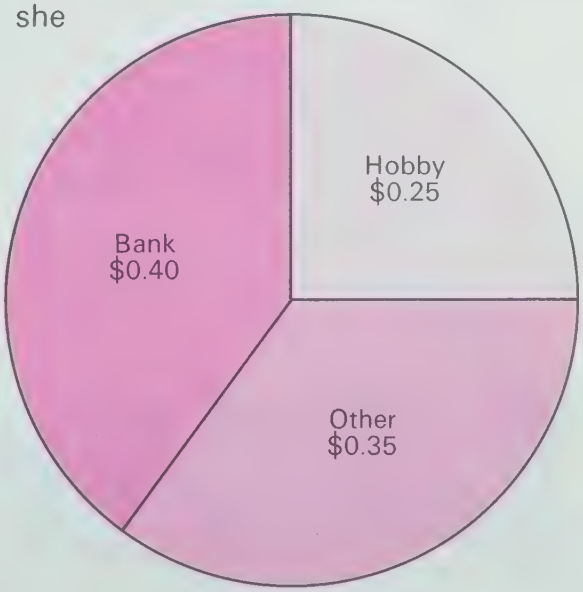
39. $\frac{0.6}{4} = \frac{■}{2}$ **40.** $\frac{5}{3} = \frac{1.5}{■}$ **41.** $\frac{2}{7} = \frac{■}{4.2}$ **42.** $\frac{9}{4.5} = \frac{5}{■}$ **43.** $\frac{1.2}{3} = \frac{■}{5}$

44. $\frac{8}{1.6} = \frac{7}{■}$ **45.** $\frac{7}{2} = \frac{■}{0.4}$ **46.** $\frac{6}{3} = \frac{1.8}{■}$ **47.** $\frac{0.7}{3} = \frac{■}{9}$ **48.** $\frac{5}{1.5} = \frac{4}{■}$

49. $\frac{5}{6} = \frac{■}{4.2}$ **50.** $\frac{9}{2.7} = \frac{5}{■}$ **51.** $\frac{2.1}{18} = \frac{■}{6}$ **52.** $\frac{6}{2} = \frac{1.5}{■}$ **53.** $\frac{2.1}{7} = \frac{■}{9}$

54. $\frac{5}{1.5} = \frac{6}{■}$ **55.** $\frac{1.2}{4} = \frac{■}{3}$ **56.** $\frac{21}{6.3} = \frac{7}{■}$ **57.** $\frac{0.7}{2} = \frac{■}{6}$ **58.** $\frac{10}{0.5} = \frac{4}{■}$

Milly drew a **circle graph** to show what she plans to do with each dollar she receives.



59. Milly is given $2.80 each week as an allowance. What would she do with the money according to her circle graph?

This chart shows how much Milly earned last week.

Babysitting	$4.00
Gardening	$2.60
Errands	$0.60

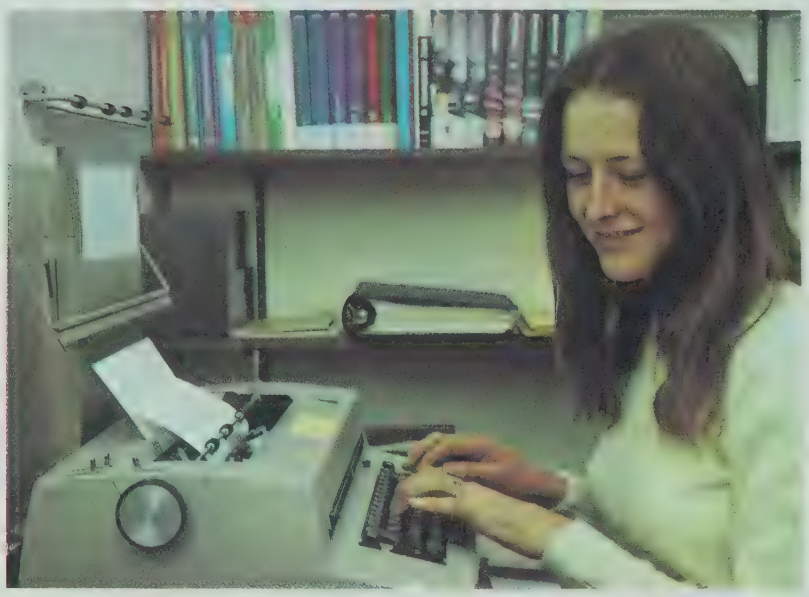
60. According to the circle graph, how will she spend the money from each activity?

*__61.__ According to the circle graph, how will Milly spend the total amount of money?

Finding Unit Rates

Linda can type 240 words in 4 min.
This **rate** can be shown like this → $\frac{240 \text{ words}}{4 \text{ min}}$.
What is this rate in words per minute?

A rate is the comparison of two unlike quantities.



To find the rate in words per minute, write and find the missing term. →

$$\frac{240}{4} = \frac{\blacksquare}{1}$$

$4 \times \blacksquare = 240 \times 1$, or 240

$240 \div 4 = 60$

$4 \times 60 = 240$

Linda can type at the rate of

$$\frac{60 \text{ words}}{1 \text{ min}},$$

or 60 words per minute.

This is an example of a **unit rate**. A unit rate is usually written like this.

Take another look:
To find the missing term in

$$\frac{240}{4} = \frac{\blacksquare}{1},$$

you could divide 240 by 4.

To find any unit rate, you divide one quantity by the other.

Working Together

What unit will be used with the unit rate?

Example: For 100 m in 16 s, the unit will be metres per second (m/s).

1. 270 km in 3 h **2.** 0.5 L in 4 s **3.** 12 g in 10 cm^3

Divide the first number by the second number to find the unit rate.

Be sure to give the correct unit for the unit rate.

4. 270 km in 3 h **5.** 0.5 L in 4 s **6.** 12 g for 10 cm^3

Exercises

Find the unit rate.

1. 100 m in 16 s **2.** 2880 kg in 12 h **3.** 1628 km in 8 d
4. 35 mL in 10 s **5.** 7.5°C in 4 d **6.** 640 m in 100 s
7. 4.8°C in 24 h **8.** 760 km in 8 h **9.** 4 L for 10 m^2
10. 1962 m^3 in 18 h **11.** 3 kg for 24 L **12.** 7875 L in 5 h

Choose one rate to describe each of these.

mL/s	m^3/min	g/s	°C/min	cm/s	g/cm	cm^3/s
°C/h	cm/min	L/m^2	kg/d	L/min	kg/L	km/h

13. how fast a snail crawls
14. how fast the temperature falls
15. how fast the bathtub empties
16. how fast a balloon inflates
17. how fast hot chocolate cools
18. how fast an airplane flies
19. how paint will cover a surface
20. how fast your mass increases

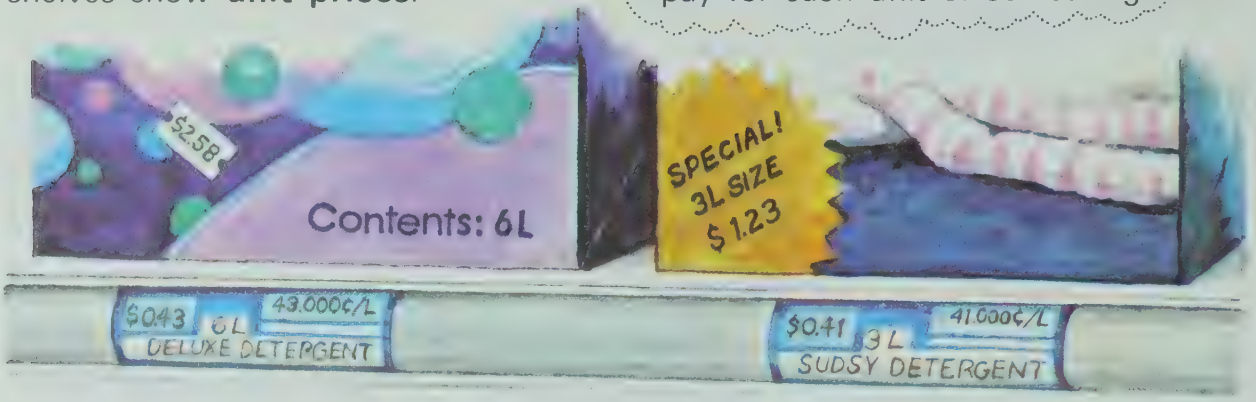
PROBLEM SOLVING

1. If 6 hens can lay 6 eggs in 6 min, how long will it take 8 hens to lay 8 eggs?

Unit Pricing

The tags along grocery store shelves show **unit prices**.

A unit price shows how much you pay for each unit of something.



This tag shows that 1 L of detergent in the larger box costs $0.43.

This tag shows that 1 L of detergent in the smaller box costs $0.41.

To find the cost of 1 L, divide the cost by the number of litres.

For the 6 L box that costs $2.58, divide $2.58 by 6.

$$6\overline{)\$2.58}\quad \$0.43$$

1 L of detergent in this box costs $0.43.

Exercises

Find the unit price to the nearest cent.

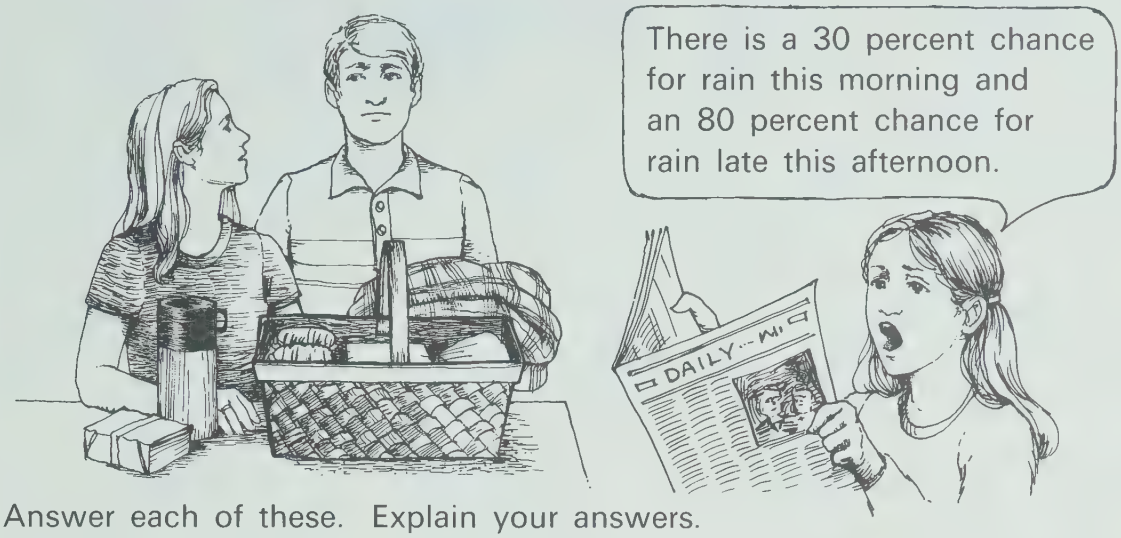
1. 3 heads of lettuce for $2.07
2. 52¢ for 2 pears
3. 6 cans of soup for $1.86
4. $1.29 for 10 kg of potatoes
5. 5 bars of soap for $2.45
6. $1.71 for 8 cans of juice
7. 3 lemons for 89¢
8. $3.98 for 4 jars of jam
9. 6 tomatoes for 96¢
10. $1.45 for 10 tomatoes

Which is the better buy,

11. 2 grapefruit for 76¢ or 5 grapefruit for $1.79?
12. $3.99 for 2 kg of nuts or $2.15 for 1 kg of nuts?
13. 4 kg of sugar for $2.16 or 10 kg of sugar for $4.98?
14. 63¢ for 1 L of milk or $1.65 for 3 L of milk?
15. 30 eggs for $2.25 or 12 eggs for 92¢?

Considering the Chances

Knowing the chance for something happening can help you know what to expect. It can also help you make a choice. What plans would you make if you heard this weather report?



Answer each of these. Explain your answers.

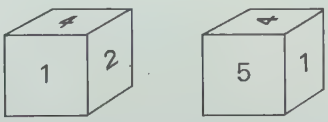
1. There are 4 brown hats and 1 blue hat in a box. What chances do you have of choosing a brown hat in the dark?

2. When you flip a penny, how often would you expect it to show "heads"?

3. Suppose each hour of the day (01 : 00, 02 : 00, 03 : 00, and so on) is written on a piece of paper and the papers are placed in a hat. If you draw one piece of paper from the hat, what are the chances that you would draw 09 : 00, 10 : 00, or 11 : 00?

4. Which would you have the best chance of guessing:
the time of the day,
the day of the week,
the day of the month, or
the month of the year
in which a person was born?

5. Suppose each of two cubes has the numbers 1 to 6 on its faces. The cubes are rolled and the sum for their top faces is found. What sum would you have the best chance of rolling?



PROBLEM SOLVING

Checking Up

Give a ratio for

1. red mittens to blue mittens.
2. blue mittens to red mittens.
3. red mittens to all the mittens.
4. blue mittens to all the mittens.

Write three ratios that are equivalent to each of these.

5. $\frac{1}{8}$ **6.** 3:6 **7.** $\frac{27}{9}$

Write each of these ratios in simplest form.

8. $\frac{10}{15}$ **9.** 21:15 **10.** $\frac{18}{8}$

Find the value for ■ that makes the ratios equivalent.

11. $\frac{1}{8} = \frac{4}{■}$ **12.** $\frac{12}{18} = \frac{■}{3}$ **13.** $\frac{45}{20} = \frac{9}{■}$ **14.** $\frac{7}{6} = \frac{■}{18}$

15. $\frac{32}{10} = \frac{■}{15}$ **16.** $\frac{5}{10} = \frac{14}{■}$ **17.** $\frac{20}{14} = \frac{■}{49}$ **18.** $\frac{35}{45} = \frac{42}{■}$

19. $\frac{4}{15} = \frac{2}{■}$ **20.** $\frac{4.9}{7} = \frac{■}{2}$ **21.** $\frac{5}{13} = \frac{1.5}{■}$ **22.** $\frac{0.5}{13} = \frac{■}{39}$

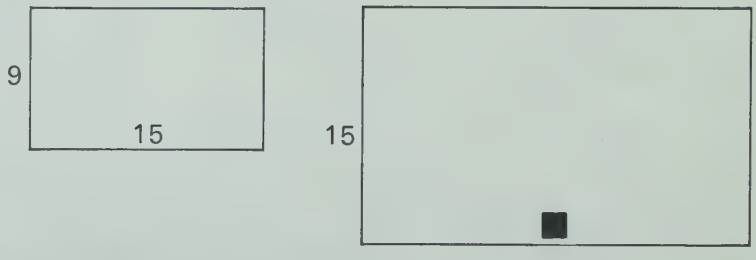
Solve.

23. 56 boys had their teeth checked. 5 out of every 8 had no new cavities. How many boys had no new cavities?

24. The ratio of "yes" votes to "no" votes was 7 to 3. There were 63 "yes" votes. How many "no" votes were there?

The figures at the right are similar.

25. Find the value for ■



Find the unit rate.

26. 1032 km in 12 h **27.** 6 kg in 8 m^3 **28.** 150 m in 20 s

Find the unit price to the nearest cent.

29. 75¢ for 6 pencils **30.** 12 boxes of berries for $4.56

Checking Skills

Multiply.

1. 2.3 × 6	**2.** 9.2 × 55	**3.** 3.65 × 10
4. 6.49 × 58	**5.** 3.108 × 70	**6.** 8.698 × 72
7. 52.8 × 100	**8.** 0.93 × 717	**9.** 9.285 × 600
10. 4.3 × 0.1	**11.** 2.4 × 1.3	**12.** 9.4 × 3.4
13. 2.77 × 3.8	**14.** 3.15 × 0.7	**15.** 7.06 × 0.01
16. 8.324 × 3.7	**17.** 4.747 × 4.8	**18.** 4.856 × 2.4
19. 16.9 × 2.91	**20.** 65.3 × 0.01	**21.** 7.89 × 39.6
22. 0.4 × 0.2	**23.** 0.28 × 0.1	**24.** 0.16 × 0.5
25. 0.039 × 0.7	**26.** 0.34 × 0.19	**27.** 0.08 × 0.01
28. \$7.29 × 2	**29.** \$5.78 × 10	**30.** \$4.15 × 2.6

Solve.

31. How many square metres are in a rectangle that is 3.5 m long and 1.8 m wide?

32. How much will 1.25 kg of hamburger cost if each kilogram costs \$3.52?

Add, subtract, multiply, or divide.

1. 4.6 + 2.5	**2.** 29 × 4.586
3. 13.72 ÷ 100	**4.** 11.4 − 7
5. 15 × 0.1	**6.** 7.4 ÷ 2
7. 5.36 − 3	**8.** 3.159 + 5.878
9. 2.9 ÷ 5	**10.** 4.03 × 100
11. 270 ÷ 75	**12.** 6.53 − 2.756
13. 8.3 + 2.85	**14.** 20.048 ÷ 10
15. 0.35 × 0.1	**16.** 8.392 − 4.7
17. 5.75 + 5	**18.** 3.76 × 100
19. 66.7 ÷ 23	**20.** 7.486 + 4.55
21. 65 − 17.5	**22.** 5.7 × 0.58
23. 1.77 + 8.58	**24.** 1.428 ÷ 3
25. 0.42 ÷ 28	**26.** 70.5 − 29.58
27. 3.2 × 5.029	**28.** 5.9589 + 8.1
29. 25.6 − 6.7	**30.** 2.3 × 3.4
31. 98 ÷ 100	**32.** 9.5 − 6.877
33. 8.291 + 16	**34.** 4.268 × 0.1
35. 8 − 2.3	**36.** 12.3 ÷ 6
37. 29 − 9.52	**38.** 8.3 + 46
39. 0.019 × 0.3	**40.** 7 − 5.469
41. 3.638 + 7.6	**42.** 189.15 ÷ 39
43. 62.96 ÷ 8	**44.** 1.97 × 0.01
45. 8.2 − 5.64	**46.** 9 + 7.26
47. 0.1 × 0.2	**48.** 4.023 − 2.848
49. 10.45 − 3.99	**50.** 0.37 × 4.92
51. 7.97 + 2.474	**52.** 318.5 ÷ 52
53. 0.74 × 0.05	**54.** 7.48 ÷ 10
55. \$9.27 + \$3.86	**56.** \$8.82 − \$3.98
57. 10 × \$2.36	**58.** \$37.66 ÷ 7
59. 1.862 + 5.7 + 2.97	
60. \$7.95 + \$6.89 + \$8.98	

13 PERCENT

Writing Percents

In a poll, 48 out of 100 students knew all the words for "O Canada".

This result can be shown as a ratio.

48 : 100 $\qquad \frac{48}{100}$

This result can be shown as a decimal.

0.48

Of the students asked, 0.48 knew all the words for "O Canada".

This result can be shown as a **percent**.

48%

Of the students asked, 48% knew all the words for "O Canada".

Question

Can you recite the words of "O Canada"?

O Canada! Our home and native land!
True patriot love in all thy sons command.
With glowing hearts we see thee rise
The True North strong and free;
From far and wide, O Canada,
We stand on guard for thee.
God keep our land glorious and free!
O Canada! We stand on guard for thee.
O Canada! We stand on guard for thee.

Knows all words	卌 卌 卌 卌 卌 卌 卌 卌 卌 |||
Knows most of words	卌 卌 卌 卌 卌 卌 卌
Knows about half of words	卌 卌 ||||
Does not know the words	|||

Percent shows how many out of 100.

For the symbol %, you would say "percent".

Working Together

How many students knew most of the words for "O Canada"? Show the result in five ways.

1. ■ out of 100 $\qquad$ 2. ■ : 100 $\qquad$ 3. $\frac{■}{100}$ $\qquad$ 4. 0.■ $\qquad$ 5. ■ %

Show the other results of the poll.

6. ■ % of the students knew about half of the words.
7. ■ % of the students did not know the words.

Exercises

Complete.

1.	75 out of 100	■ :100	$\frac{■}{100}$	0.■	■ %
2.	?	9:100	?	?	?
3.	?	?	$\frac{50}{100}$	?	?
4.	?	?	?	0.01	?
5.	?	?	?	?	95%

For each of these, write a sentence using %.

6. In the poll, 83 out of 100 students knew most or all of the words for "O Canada".

7. 70 out of the 100 students in the poll had to use the tune to help them remember the words.

For each of these, write a sentence using a ratio.

8. 7% of the students said that they had the song on a record at home.

9. 90% of the students knew the tune for "O Canada".

Fractions and Decimals as Percents

Jerry estimated that $\frac{3}{4}$ of the students were wearing running shoes.

The fraction $\frac{3}{4}$ is equivalent to $\frac{75}{100}$.

$$\frac{3}{4} \overset{3 \times 25}{=} \frac{75}{100} \quad (4 \times 25)$$

$\frac{75}{100}$ can be shown as 0.75 or as 75%.

Jerry estimated that 0.75 of the students were wearing running shoes.

Jerry estimated that 75% of the students were wearing running shoes.

Working Together

Show each fraction as a decimal.

Example: For $\frac{3}{4}$, use $\frac{3}{4} = \frac{75}{100}$, or $4\overline{)3.00}$ $\quad 0.75$.

To change a fraction to a decimal, divide the numerator by the denominator.

1. $\frac{1}{2}$ **2.** $\frac{9}{10}$ **3.** $\frac{2}{5}$ **4.** $\frac{6}{8}$

Show each decimal as a percent.

5. 0.25 **6.** 0.9 **7.** 0.06

Show each fraction as a percent.

8. $\frac{37}{100}$ **9.** $\frac{2}{5}$ **10.** $\frac{6}{8}$

Exercises

Show each decimal as a percent.

1. 0.45 **2.** 0.2 **3.** 0.02 **4.** 0.8 **5.** 0.91 **6.** 0.05

Show each fraction as a percent.

7. $\frac{71}{100}$ **8.** $\frac{3}{5}$ **9.** $\frac{7}{10}$ **10.** $\frac{9}{12}$ **11.** $\frac{5}{5}$ **12.** $\frac{1}{2}$

13. $\frac{3}{10}$ **14.** $\frac{1}{20}$ **15.** $\frac{4}{5}$ **16.** $\frac{12}{16}$ **17.** $\frac{4}{4}$ **18.** $\frac{16}{20}$

Sometimes more than two decimal places are needed when a fraction is changed to a decimal. Change each of these to a decimal by dividing the numerator by the denominator. Then round the quotient to two decimal places.

19. $\frac{1}{3}$ **20.** $\frac{5}{8}$ **21.** $\frac{2}{9}$ **22.** $\frac{6}{7}$ **23.** $\frac{1}{12}$ **24.** $\frac{1}{6}$

Use your results from Exercises 19 to 24 to write a percent for each of these fractions.

25. $\frac{1}{3}$ **26.** $\frac{5}{8}$ **27.** $\frac{2}{9}$ **28.** $\frac{6}{7}$ **29.** $\frac{1}{12}$ **30.** $\frac{1}{6}$

For each of these, write a sentence using percent.

31. 5 out of every 10 apples were bruised in the hailstorm.

32. 1 out of every 8 entries received a prize.

33. 3 out of every 4 students knew the name of the premier.

34. Mrs. Tull works 5 of the 7 d of the week.

35. We can expect warm weather in 5 of the 12 months.

36. The team won 2 out of every 3 games it played.

37. We work 8 of the 16 h that we are awake.

38. We work 8 of the 24 h in each day.

Percents as Decimals and Fractions

Some people spend 33% of their lifetimes asleep.

$$33\% = 0.33, \text{ or } \frac{33}{100}.$$

$\frac{33}{100}$ is almost equal to $\frac{1}{3}$.

33% is about $\frac{1}{3}$.

Some people spend about $\frac{1}{3}$ of their lifetimes asleep.

Working Together

Show each percent as a decimal.

1. 62% **2.** 7% **3.** 70%

Show each decimal as a fraction with a denominator of 100.

4. 0.50 **5.** 0.80 **6.** 0.75

Show each percent as a fraction with a denominator of 100.

7. 70% **8.** 53% **9.** 5%

Show each percent as a fraction in lowest terms.

10. 40% **11.** 25% **12.** 8%

Exercises

Show each percent as a decimal.

1. 95% **2.** 1% **3.** 30% **4.** 80% **5.** 8% **6.** 50%

Show each percent as a fraction with a denominator of 100.

7. 3% **8.** 99% **9.** 13% **10.** 7% **11.** 21% **12.** 60%

Show each percent as a fraction in lowest terms.

13. 10% **14.** 75% **15.** 50% **16.** 35% **17.** 4% **18.** 80%

For each of these, write a sentence using a fraction in lowest terms.

19. Some people spend 67% of their lifetimes awake.

20. An average 11-year-old boy has grown to about 81% of his adult height.

21. An average 11-year-old girl has grown to about 93% of her adult height.

22. An average 12-year-old boy has grown to about 84% of his adult height.

23. About 20% of the air we breathe in is oxygen.

24. About 80% of the air we breathe in is nitrogen.

25. About 17% of the air we breathe out is oxygen.

26. About 78% of the air we breathe out is nitrogen.

27. About 5% of the air we breathe out is carbon dioxide.

28. The mass of oxygen in the human body is about 63% of the total mass of the body.

Match one of these fractions with the percent closest in value to it.

$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{1}{7}$	$\frac{1}{8}$	$\frac{1}{9}$

29. 25%

30. 14%

31. 50%

32. 11%

33. 20%

34. 33%

35. 13%

36. 17%

Sometimes percents will be decimals or numbers in mixed form.

Examples: 33.3% is 0.333.
It is closer to $\frac{1}{3}$ than 33% is.
$33\frac{1}{3}\%$ is exactly $\frac{1}{3}$.

Use a one-place decimal to show a percent for each of these.

1. $\frac{2}{3}$ **2.** $\frac{5}{6}$ **3.** $\frac{1}{8}$ **4.** $\frac{8}{9}$ **5.** $\frac{7}{12}$

Show a percent with a fraction for each of these.

6. $\frac{2}{3}$ **7.** $\frac{5}{6}$ **8.** $\frac{1}{8}$ **9.** $\frac{8}{9}$ **10.** $\frac{7}{12}$

Finding a Percent of a Number

The mass of bone in the human body is about 18% of the total mass of the body. Stephanie has a mass of 38 kg. How heavy are her bones?

To find

18% of 38,

find

0.18 of 38,

or

0.18×38.

$$\begin{array}{r} 38 \\ \times\ 0.18 \\ \hline 3\,04 \\ 3\,80 \\ \hline 6.84 \end{array}$$

To find a percent of a number, change the percent to a decimal and multiply.

Stephanie's bones have a mass of 6.84 kg.

Working Together

What two numbers are multiplied to find each of these?

1. 85% of 67 **2.** 6% of 120 **3.** 70% of 2379

Find each of these.

4. 85% of 67 **5.** 6% of 120 **6.** 70% of 2379

Exercises

Find each of these.

1. 40% of 375
2. 5% of 60
3. 50% of 172
4. 95% of 780
5. 67% of 48
6. 75% of 16 000
7. 1% of 35
8. 10% of 350
9. 30% of 4570
10. 25% of 9724

This chart shows information about the mass of the human body.

	Female	Male
Water	54%	60%
Muscle	36%	42%
Fat	28%	18%
Bone	18%	18%

Use the chart to help you answer these questions.

11. How much of Stephanie is water?
12. How much of Stephanie is muscle?
13. How much of Stephanie is fat?

Todd has a mass of 34 kg.

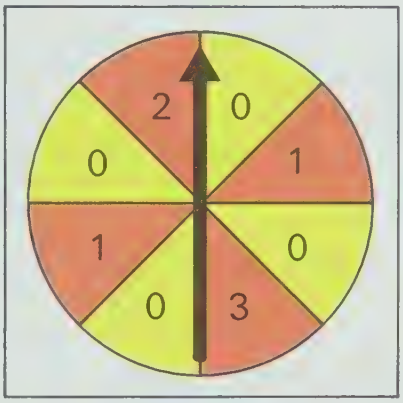
14. How much of Todd is water? muscle? fat? bone?

*15. How much of you is water? muscle? fat? bone?

Percents you observe can help you make estimates.

1. A baseball pitcher has struck out 40% of the batters in past games. In the next game, what would be a reasonable number to expect the pitcher to strike out in facing 27 batters?
2. 33% of the nuts in a can are cashews. If you take 35 nuts from the can without looking, what would be a reasonable number of cashews to expect?

This spinner is divided into 8 sections, all the same size.



3. What percent of the spaces show 0?
4. What percent show 1?

In 200 spins, how many times could you expect to

5. score 0?
6. score 1?

What total score could you reasonably expect in

7. 200 spins?
8. 1000 spins?

PROBLEM SOLVING

Interest

Interest is the amount paid for using money that belongs to someone else.

Sandra has $50 in her savings account. Each year the bank pays Sandra interest that is equal to 5% of the $50.

For 5% of $50, multiply 0.05 and 50.

$$0.05 \times 50 = 2.50$$

Each year the bank pays Sandra $2.50 interest.

The bank uses Sandra's $50 and other money to make loans. Each year the bank receives interest that is equal to 9% of its loans.

For 9% of $50, multiply 0.09 and 50.

$$0.09 \times 50 = 4.50$$

Each year that the bank is able to have Sandra's $50 out on loan, it receives $4.50 for the $50.

When it is able to have Sandra's $50 out on loan, the bank earns 4% of the $50, or $2.00, in profit.

$$0.04 \times 50 = 2.00$$

This is one way that a bank is able to stay in business.

Banks pay interest at different times during the year.

Exercises

Find each of these.

1. 4% of $350
2. 5% of $350
3. 6% of $350
4. 7% of $350
5. 8% of $350
6. 9% of $350
7. 10% of $350
8. 12% of $350
9. 13% of $350
10. 14% of $350
11. 15% of $350

Solve.

12. You deposit $75.50 in a bank. In a year the bank will pay you 6% of $75.50 in interest. How much will the interest be?

13. You borrow $25 from your parents and offer to pay 2% of $25 as interest. How much will the interest be?

Complete this chart.

	Deposit	Each year the bank pays interest that is this percent of the deposit.	In one year the interest will be
14.	$10 000	9%	?
15.	$ 2 500	7%	?
16.	$ 39.50	6%	?

At the start of each year for 5 years, Emlyn deposited $50 in his savings account. He received 9% interest on his savings at the end of each year. Each year he added the interest to his account.

Interest on a savings account is rounded to the nearest cent.

PROBLEM SOLVING

1. If Emlyn made no other deposits or withdrawals, how much would he have in his account at the end of 5 years?

Discount

A **discount** is the amount that is taken away from a given price or from a given amount of money.

For the sale on Wednesday, there will be a discount on each item that is 20% off the regular price.

The regular price for a jacket is $8.48. What will the discount be? What will the sale price of the jacket be on Wednesday?

For 20% of $8.48, multiply 0.20 and 8.48.

$$\begin{array}{r} 8.48 \\ \times\ 0.20 \\ \hline 1.6960 \end{array}$$

1.6960 rounds to 1.70.

The discount on the jacket on Wednesday will be $1.70.

For the sale price on Wednesday, subtract 1.70 from 8.48.

$$\begin{array}{r} 8.48 \\ -\ 1.70 \\ \hline 6.78 \end{array}$$

The sale price for the jacket on Wednesday will be $6.78.

Whatever you do this week, don't miss our

THE BARGAIN MART

GOING OUT OF BUSINESS SALE ! ! !

THE BARGAIN MART

Wednesday: All merchandise will be marked down ⟶ 20%

Thursday: Remaining merchandise will be marked down another ⟶ 25%

Friday: Remaining merchandise will be marked down another ⟶ $33\frac{1}{3}\%$

After that, our doors will be closed forever!

HURRY! HURRY! HURRY!

Exercises

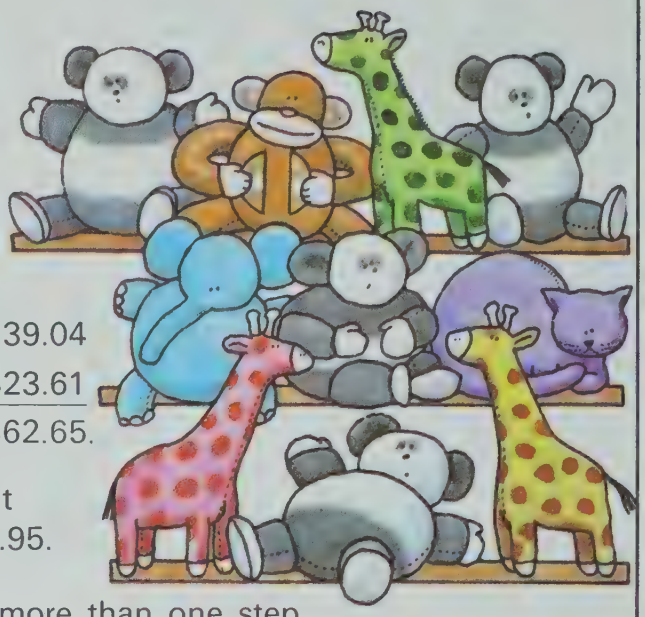
Complete.

			Wednesday		Thursday		Friday	
		Regular price	Discount	Sale price	Discount	Sale price	Discount	Sale price
1.	Shirts	$4.00	?	?	?	?	?	?
2.	Jeans	$7.60	?	?	?	?	?	?
3.	Hats	$3.75	?	?	?	?	?	?
4.	Belts	$3.26	?	?	?	?	?	?
5.	Shoes	$10.50	?	?	?	?	?	?
6.	Socks	69¢	?	?	?	?	?	?

7. Give a price of something that you bought recently.
What would be its price in this store on Friday of this sale?

Solving Problems in More Than One Step

Mrs. Cotter bought a stuffed panda for each of four nieces and a stuffed giraffe for each of three other nieces. Each stuffed panda cost $9.76. Each stuffed giraffe cost $7.87. What was the average amount she spent for each niece?



4 stuffed pandas cost $4 \times \$9.76$, or $\$39.04$
3 stuffed giraffes cost $3 \times \$7.87$, or $\$23.61$
The 7 stuffed animals cost $\$62.65$.

The average amount Mrs. Cotter spent for each niece was $\$62.65 \div 7$, or $\$8.95$.

Solve these problems. Each requires more than one step.

1. A pencil costs 19¢. An eraser costs 15¢. Lloyd bought 3 pencils for himself and a pencil and an eraser for each of his 6 friends. How much did he spend?

2. Sheila bought 6 trays, each a different size. The smallest cost $7.89. Each increase in size increased the price of a tray by $2.74. What was the average price for each tray?

3. In Manitoba an amount equal to 5% of the regular price is added to the regular price as a sales tax. In Nova Scotia the sales tax is 8% of the regular price. A game costs $24 in Manitoba. In Nova Scotia, it costs 25¢ less. In which province would you pay more for the game?

4. The regular mail-order price was $11.95. The sale price was 20% off the regular price. The sales tax is 8%. There is also a fee of $2.25 for postage. How much must be paid for the mail order?

5. Mrs. Cotter bought 5 cans of engine oil at $1.32 each. At another store she bought 6 cans of the same oil for 25% off $1.32. What was the average price that Mrs. Cotter paid for a can of oil?

PROBLEM SOLVING

Checking Up

Complete.

1.	58 out of 100	?	?	?	?
2.	?	30:100	?	?	?
3.	?	?	$\frac{7}{100}$	?	?
4.	?	?	?	0.94	?
5.	?	?	?	?	2%

Write a percent for each decimal.

6. 0.82 **7.** 0.25 **8.** 0.08 **9.** 0.6 **10.** 0.33

Write a percent for each fraction.

11. $\frac{23}{100}$ **12.** $\frac{3}{4}$ **13.** $\frac{7}{10}$ **14.** $\frac{2}{5}$ **15.** $\frac{3}{12}$

16. $\frac{1}{3}$ **17.** $\frac{4}{9}$ **18.** $\frac{3}{8}$ **19.** $\frac{1}{6}$ **20.** $\frac{5}{7}$

Write a decimal for each percent.

21. 49% **22.** 7% **23.** 40% **24.** 75% **25.** 1%

Write a fraction with a denominator of 100 for each percent.

26. 81% **27.** 9% **28.** 54% **29.** 70% **30.** 75%

Write a fraction in lowest terms for each percent.

31. 30% **32.** 60% **33.** 50% **34.** 25% **35.** 80%

Find each of these.

36. 38% of 75 **37.** 67% of 300 **38.** 40% of 95

Solve.

39. How heavy are the sunflower seeds in 25 kg of bird seed when 40% of the mass is sunflower seeds?

40. The discount is 20% off the original price. The original price was $2.80. How much is the discount?

41. Each year the bank pays interest equal to 9% of the money in a savings account. How much interest will it pay on savings of $178?

42. Each year the bank charges interest equal to 12% of the amount it has loaned. What will be the interest for a loan of $650?

14 MOTION GEOMETRY

Slides

The ski tow is like a **slide arrow**. A skier at the top of the hill is like a **slide image** of a skier at the bottom of the hill.

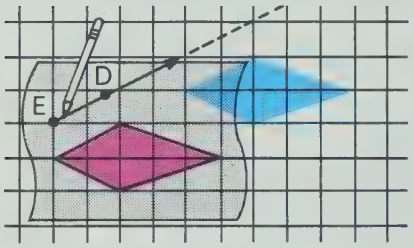
The slide arrow shows the distance and the direction of the slide.

Working Together

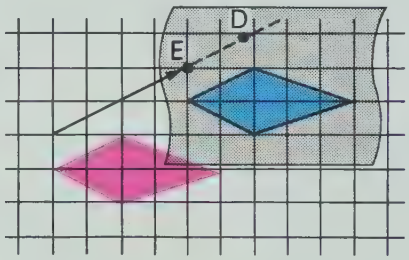
Is the blue shape the slide image of the red shape for the slide arrow shown?

When a tracing matches a shape, the tracing fits exactly onto the shape.

Extend the arrow.
Trace the red shape.
Mark points E (end point) and D on the tracing.



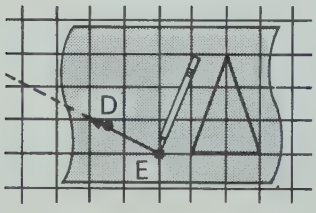
Slide the tracing so that E and D move along the slide arrow until E is over the tip of the arrow.



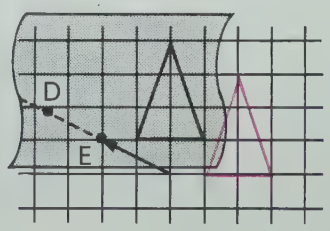
If the tracing matches the blue shape, the blue shape is the slide image of the red shape for the slide arrow shown.

Draw the slide image of the triangle for the slide arrow shown.

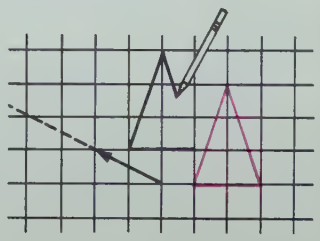
Extend the arrow.
Trace the triangle.
Mark points E (end point) and D on the tracing.



Slide the tracing so that E and D move along the slide arrow until E is over the tip of the arrow.



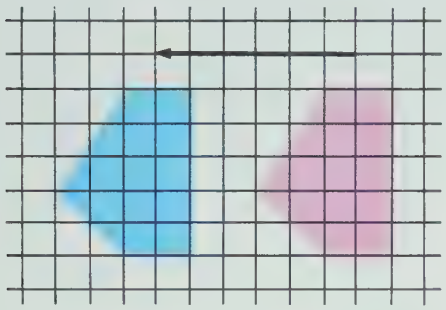
Mark the vertices.
Remove the tracing. Draw the slide image.



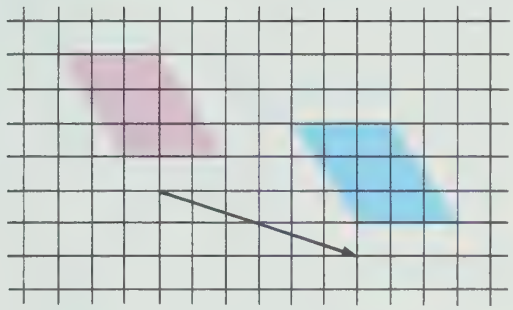
Exercises

Copy each picture on graph paper. Use tracing paper to test whether the blue shape is the slide image of the red shape for the slide arrow shown.

1.

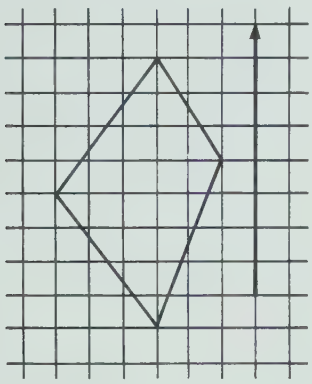


2.

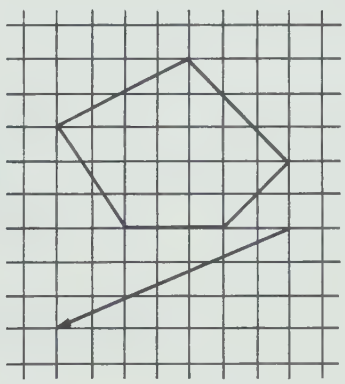


Copy each shape and the slide arrow on graph paper. Use tracing paper to help you draw the slide image of the shape for the slide arrow shown.

3.

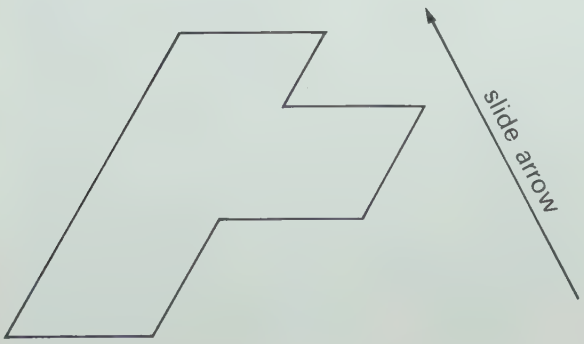


4.

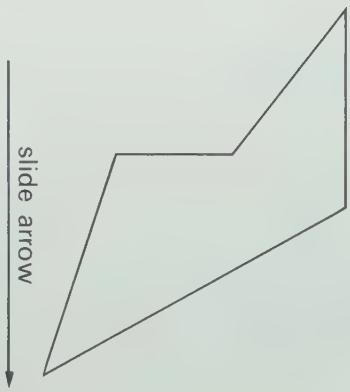


Trace each shape and the slide arrow on plain paper. Use tracing paper to help you draw the slide image.

5.

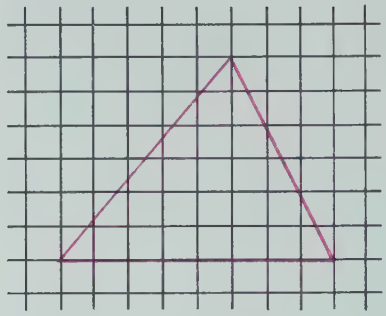


6.

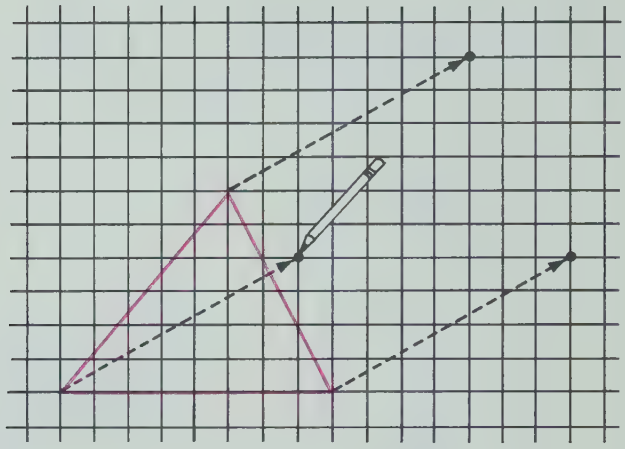


Drawing a Slide Image Using a Rule

Draw the slide image of the red shape for the rule (7R, 4U).

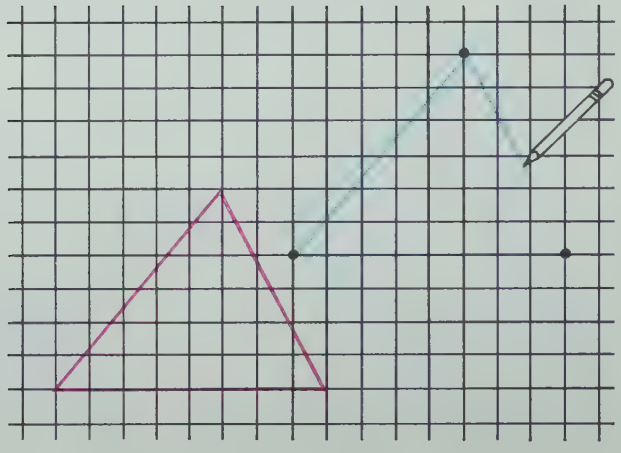


From each vertex, count 7 units to the *Right* and 4 units *Up*. Draw the image point for each vertex.



Join the points.

The blue shape is the slide image of the red shape for the rule (7R, 4U).



(7L, 4D) would mean 7 units to the *Left* and 4 units *Down*.

Working Together

Draw a point on graph paper as shown. Draw its image for each rule.

1. (5R, 2D)

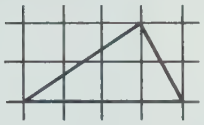
2. (3L, 0)

Write the rule for each slide arrow.

5.

6.

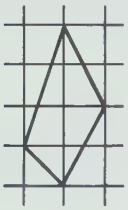
Copy the shape on graph paper. Draw its slide image for each rule.



3. (0, 5U)

4. (3R, 3D)

Copy the shape on graph paper. For each slide arrow, write the rule and draw the slide image.

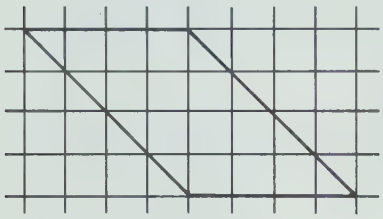


7.

8.

Exercises

Copy the shape on graph paper. Draw its slide image for each rule.



1. (5R, 2U)

2. (0, 4D)

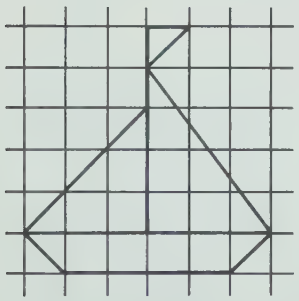
3. (3L, 4U)

4. (7L, 7D)

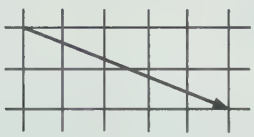
5. (4L, 0)

6. (6R, 8D)

Copy the shape on graph paper. For each slide arrow, write the rule and draw the slide image.

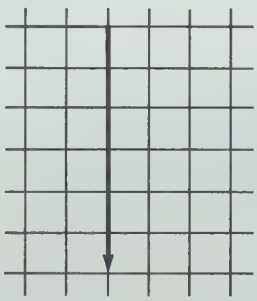


7.

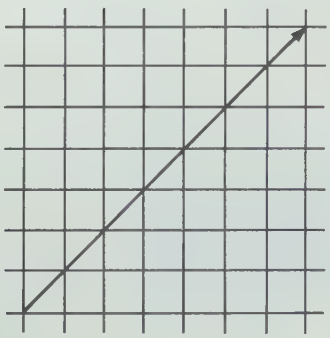


8.

9.



10.



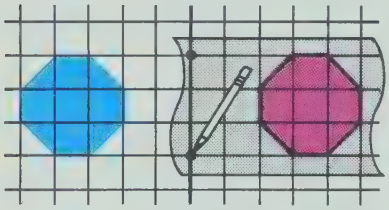
Flips

One side of the butterfly is like a **flip image** of the other side. The black line represents the **flip line**.

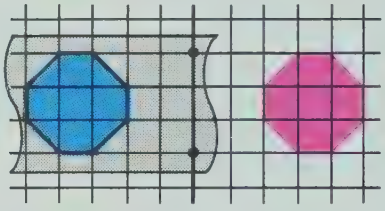
Working Together

Is the blue shape the flip image of the red shape for the flip line shown?

Mark two points on the flip line. Trace the red shape and the two points.



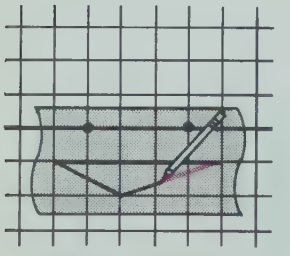
Flip the tracing over. Match the two points on the tracing with those on the flip line.



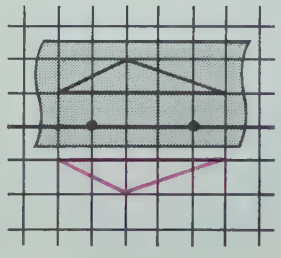
If the tracing matches the blue shape, the blue shape is the flip image of the red shape for the flip line shown.

Draw the flip image of the triangle for the flip line shown.

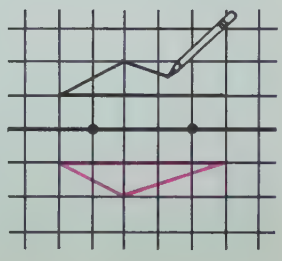
Mark two points on the flip line. Trace the triangle and the two points.



Flip the tracing over. Match the two points on the tracing with those on the flip line.

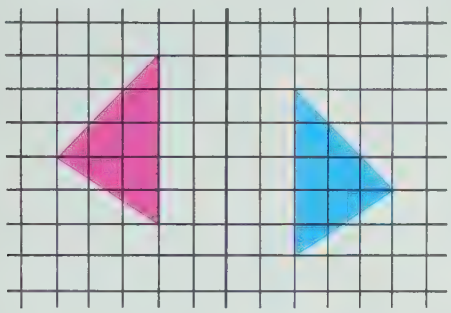


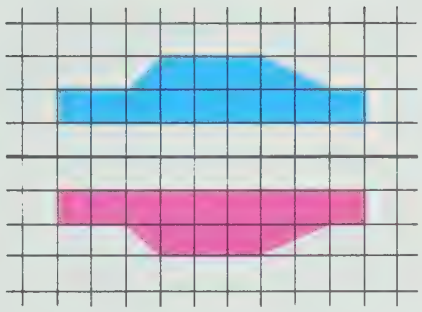
Mark the vertices. Remove the tracing. Draw the flip image.



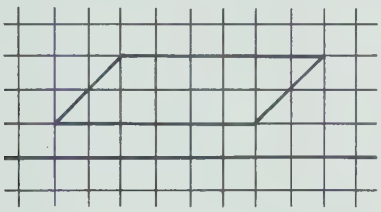
Exercises

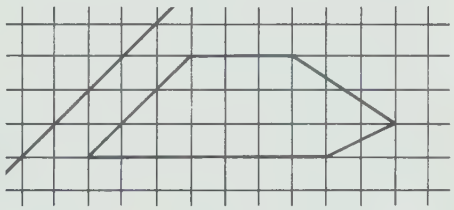
Copy each picture on graph paper. Use tracing paper to test whether the blue shape is the flip image of the red shape for the flip line shown.

1. 

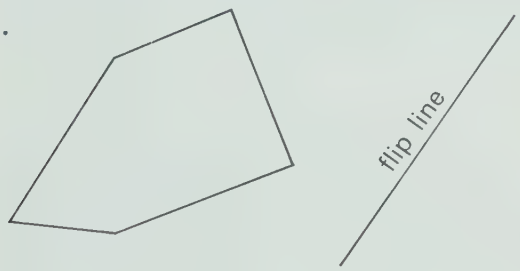
2. 

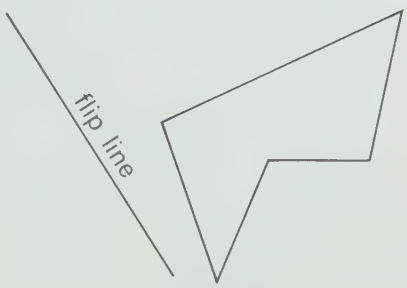
Copy each shape and the flip line on graph paper. Use tracing paper to help you draw the flip image of the shape for the flip line shown.

3. 

4. 

Trace each shape and the flip line on plain paper. Use tracing paper to help you draw the flip image.

5. 

6. 

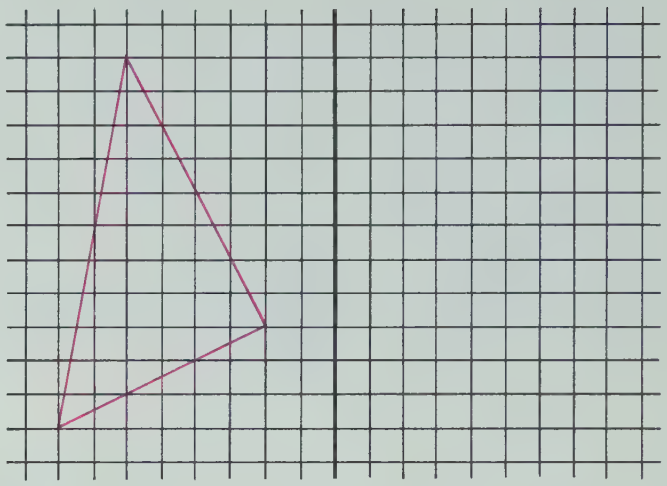
Divide. Use extra zeros if needed.

1. $10\overline{)\$64}$	**2.** $26\overline{)\$444.34}$	**3.** $45\overline{)\$160.65}$	**4.** $84\overline{)\$21}$
5. $77\overline{)191.73}$	**6.** $36\overline{)291.78}$	**7.** $930\overline{)2864.4}$	**8.** $10\overline{)396.7}$
9. $657\overline{)571.59}$	**10.** $14\overline{)126.63}$	**11.** $100\overline{)6539}$	
12. $600\overline{)2826}$	**13.** $875\overline{)945}$	**14.** $55\overline{)3874.2}$	

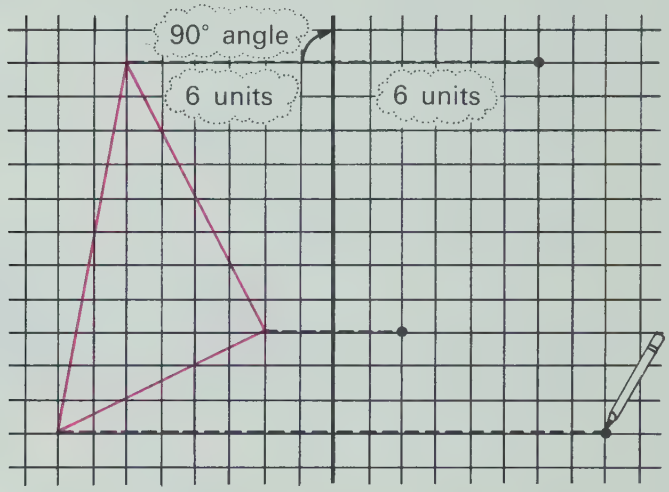
KEEPING SHARP

Drawing a Flip Image by Counting

Draw the flip image of the red shape for the flip line shown.



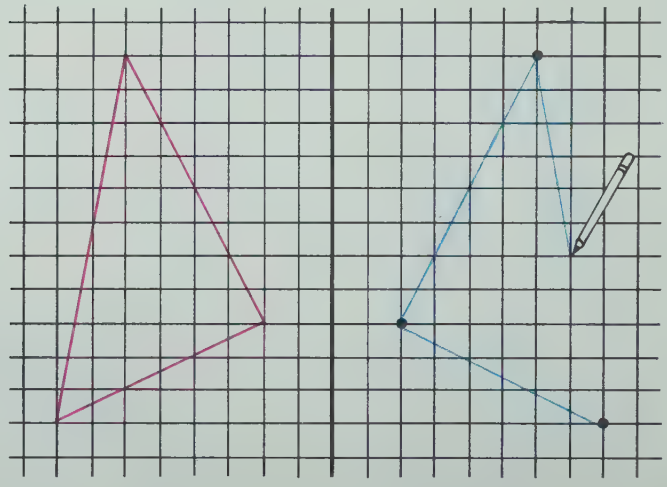
From each vertex, count the units from the vertex to the flip line. Then count that many units on the other side of the flip line. Draw the image point.



Join the points.

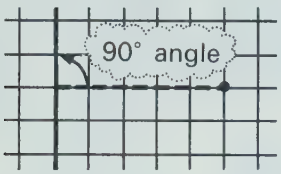
Each point of the red shape is the same distance from the flip line as its flip image.

The blue shape is the flip image of the red shape for the flip line shown.



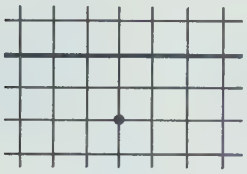
Working Together

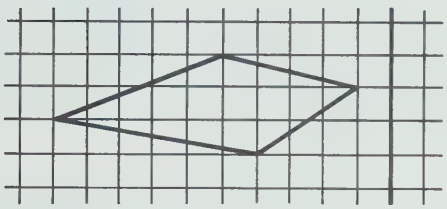
Find the distance between the point and the line.

1. 

Copy the picture on graph paper. Draw the flip image of the shape for the flip line shown.

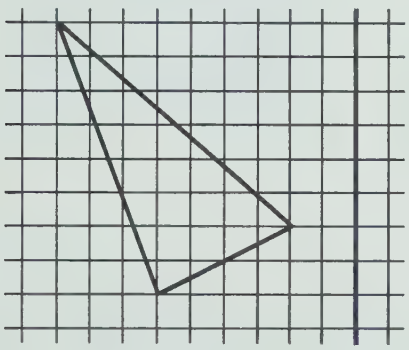
Copy the picture on graph paper. Draw the flip image of the point for the flip line shown.

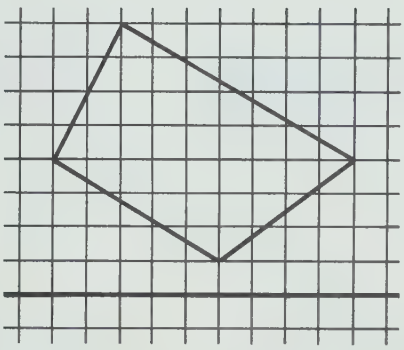
2. 

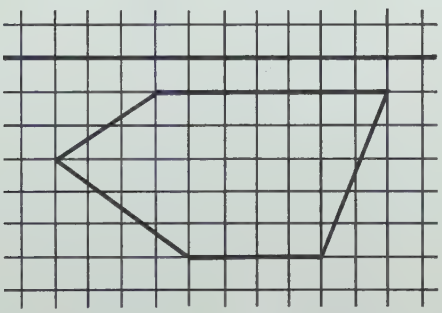
3. 

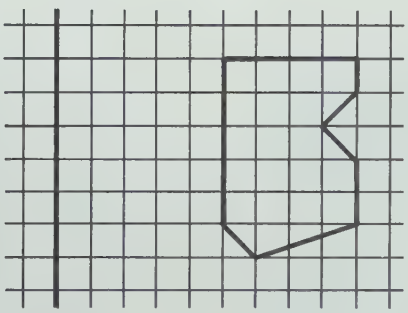
Exercises

Copy each picture on graph paper. Draw each flip image of the shape for the flip line shown.

1. 

2. 

3. 

4. 

Turns

When a number is dialed, the finger wheel is like a **turn image** of itself at rest.

The **turn angle** shows the amount and the direction of the turn.

Turns can be clockwise or counterclockwise.

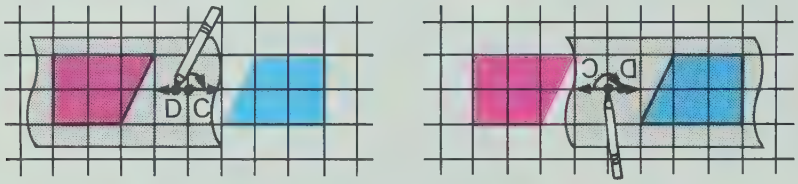
Working Together

Is the blue shape the turn image of the red shape for the turn angle shown?

Trace the red shape. Mark points C (turn centre) and D on the tracing.

Turn the tracing about C until D is on the other ray of the turn angle.

If the tracing matches the blue shape, the blue shape is the turn image of the red shape for the turn angle shown.

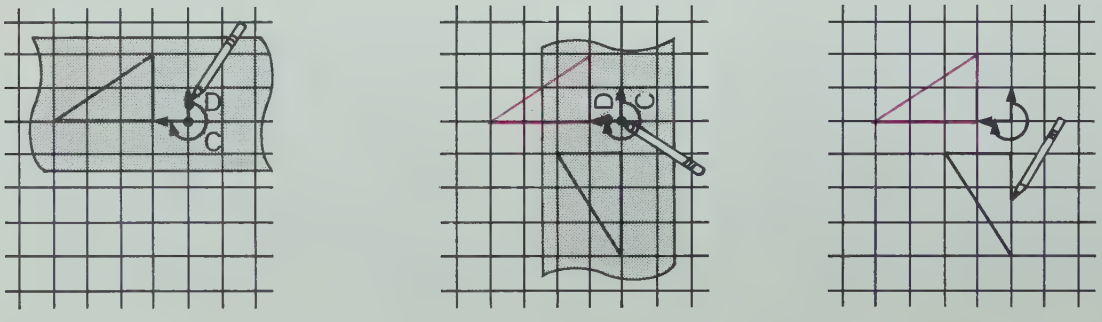


Draw the turn image of the triangle for the turn angle shown.

Trace the triangle. Mark points C (turn centre) and D on the tracing.

Turn the tracing about C until D is on the other ray of the turn angle.

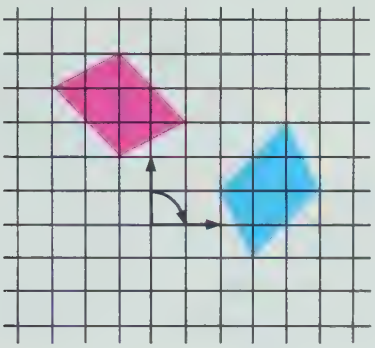
Mark the vertices. Remove the tracing. Draw the turn image.



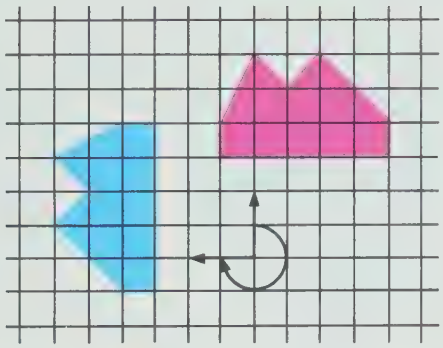
Exercises

Copy each picture on graph paper. Use tracing paper to test whether the blue shape is the turn image of the red shape for the turn angle shown.

1.

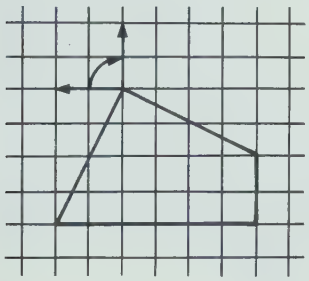


2.

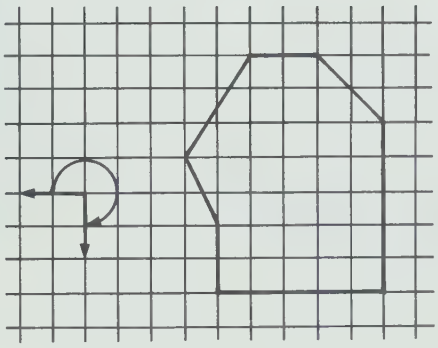


Copy each shape and the turn angle on graph paper. Use tracing paper to help you draw the turn image of the shape for the turn angle shown.

3.

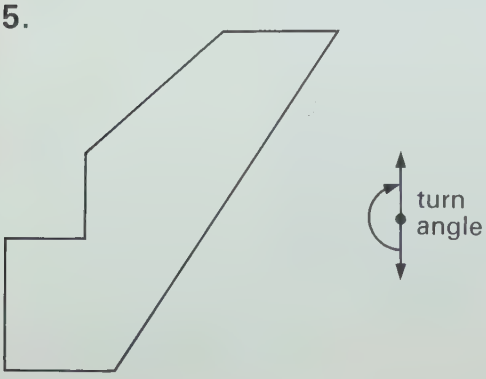


4.

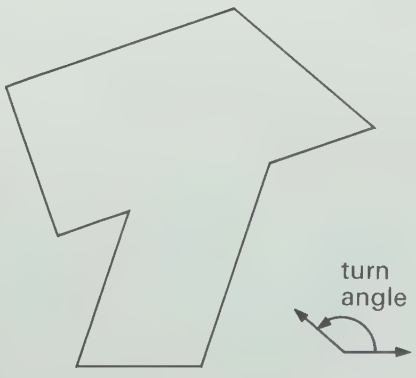


Trace each shape and the turn angle on plain paper. Use tracing paper to help you draw the turn image.

5.



6.

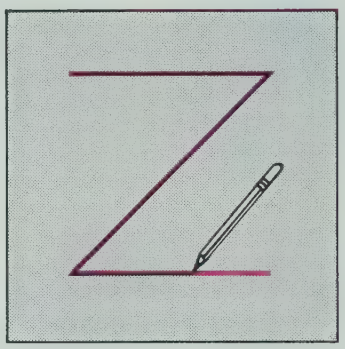


Rotational Symmetry

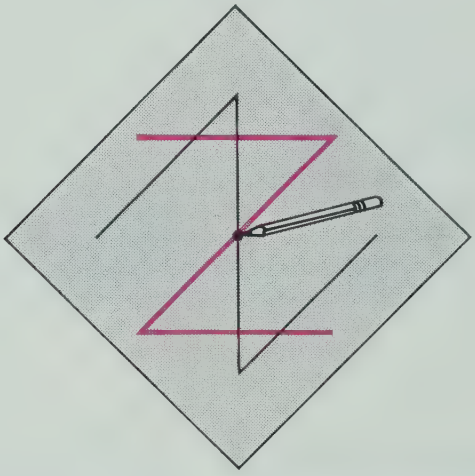
The letter Z has **rotational symmetry**, or **turn symmetry**.

A shape that fits onto itself after a turn less than a full turn has rotational symmetry, or turn symmetry.

Trace the letter Z.

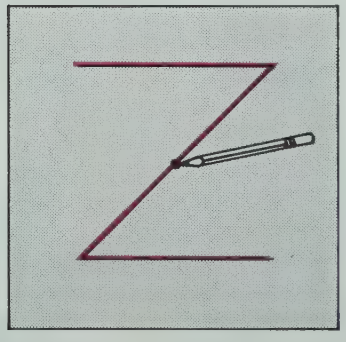


Turn the tracing . . .



. . . until it fits onto the original letter Z.

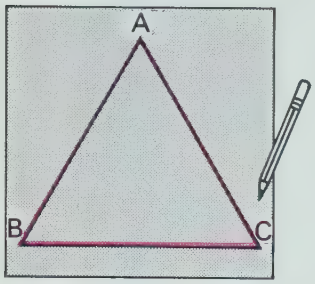
After a half turn, the tracing fits onto the original letter Z.



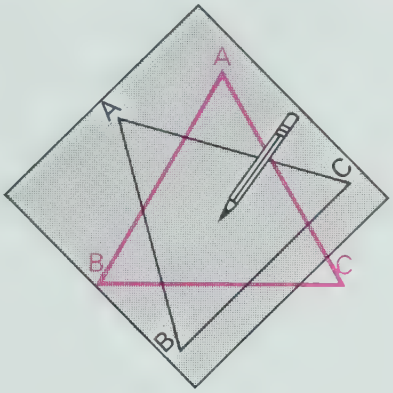
Working Together

Does △ABC have turn symmetry?

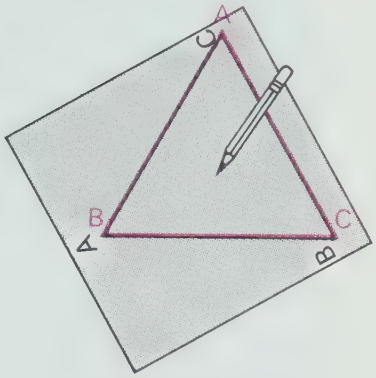
Trace the triangle and A, B, and C.



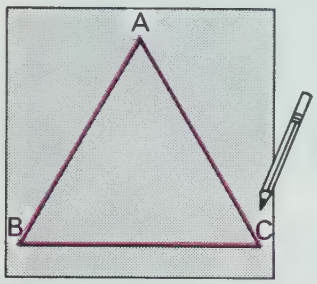
Turn the tracing . . .



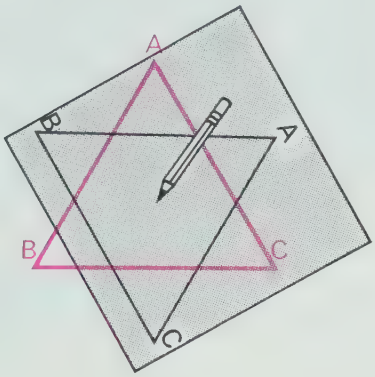
. . . until it fits onto the original triangle.



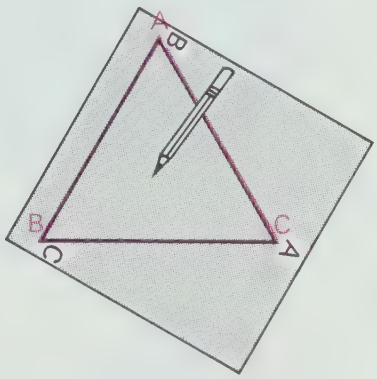
Trace the triangle and A, B, and C.



Turn the tracing in the other direction . . .



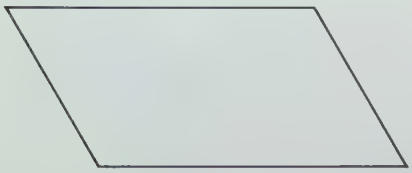
. . . until it fits onto the original triangle.



Exercises

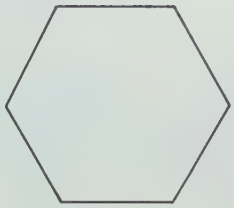
Use tracing paper to test each of these for turn symmetry. For those with turn symmetry, give the number of different turns less than a full turn for which the shape fits onto itself.

1.



2.

3.



4. the letters A to Y

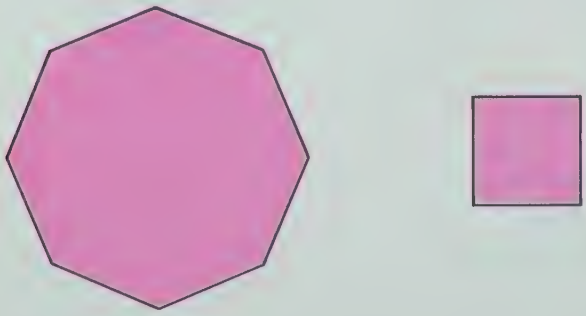
Tiling Patterns

The tiles are geometric shapes that form a pattern.

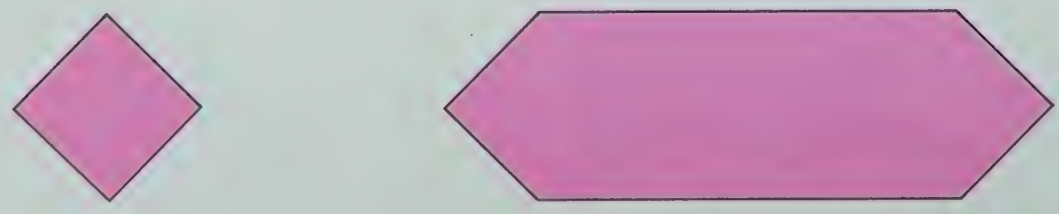
Exercises

Use these shapes to make a pattern without spaces.

1.



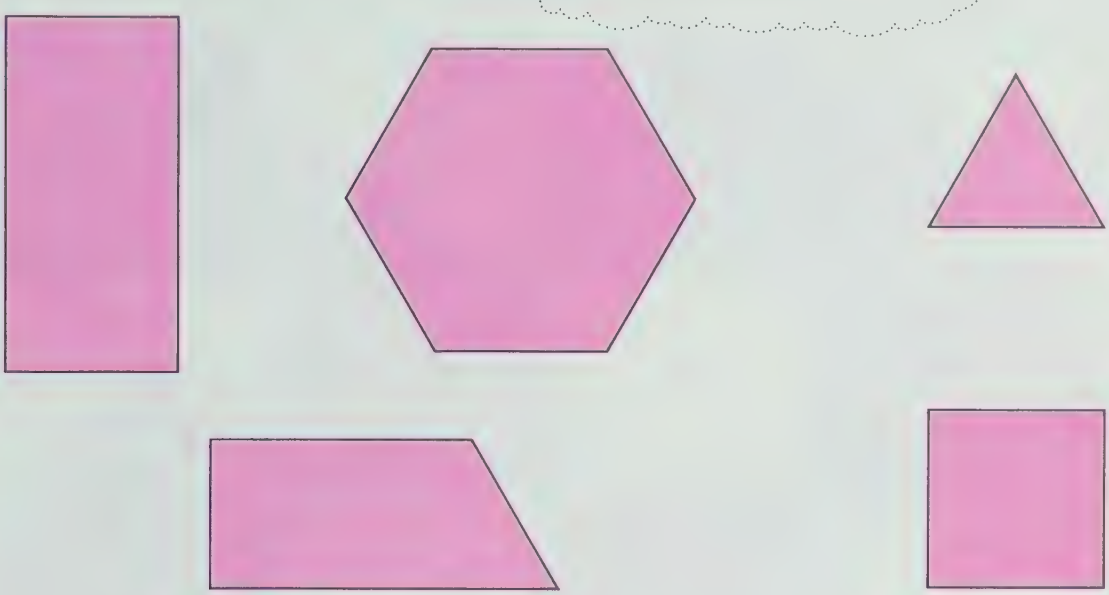
2.



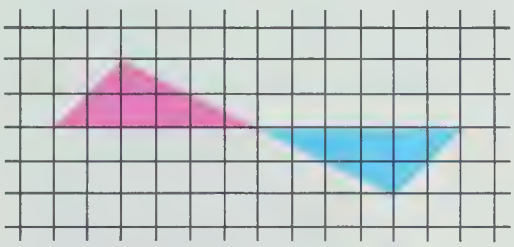
Use at least three of these shapes together to make a pattern.

The shapes should touch, but not overlap.

3.



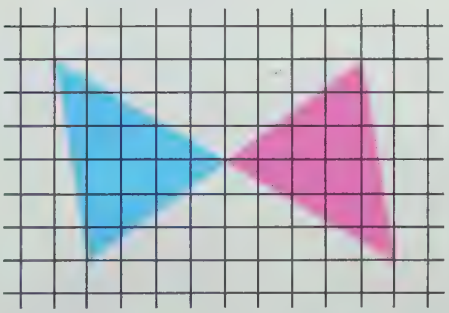
This is an example of a $\frac{1}{2}$ turn.



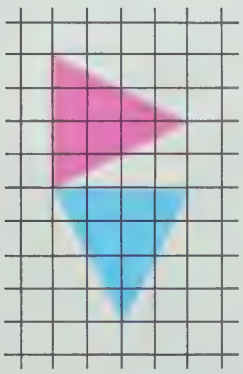
Here are examples of different turns.

The blue shape is a turn image of the red shape.
Use tracing paper to find out whether the turn is a $\frac{1}{4}$, a $\frac{1}{2}$, or a $\frac{3}{4}$ turn.

1.



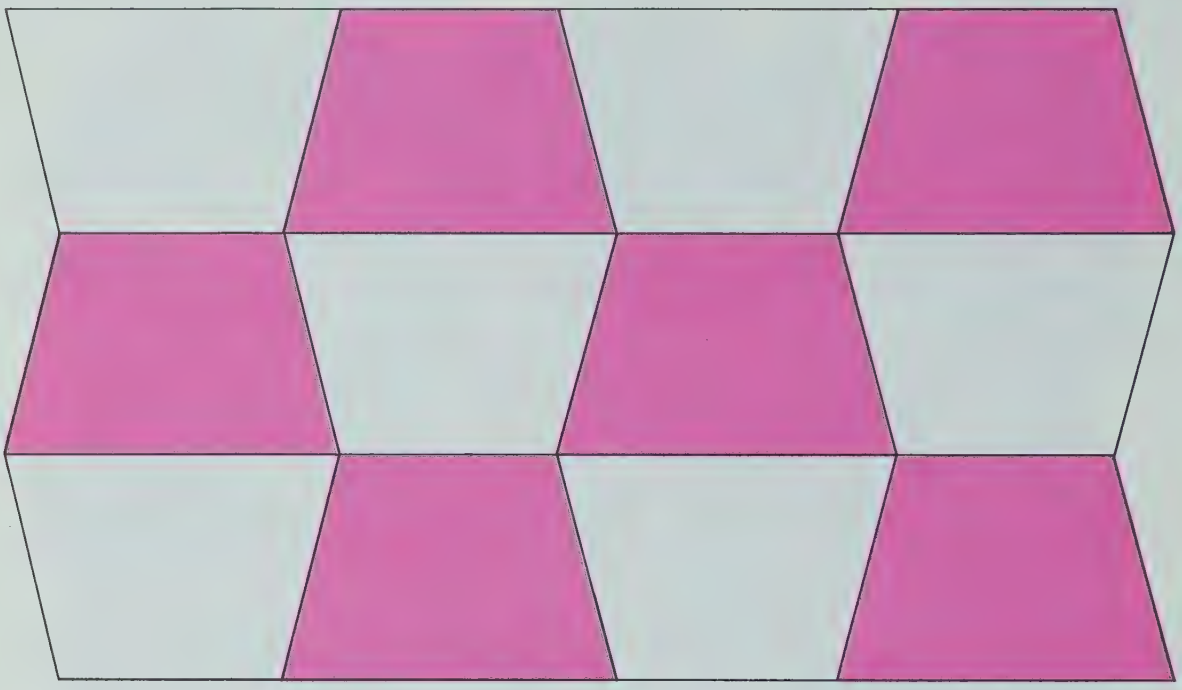
2.



try this

Tiling the Plane

Anita made this tiling pattern with a trapezoid.



Patterns like this that can be made using one shape are called **tessellations**.

Working Together

For the pattern shown above,

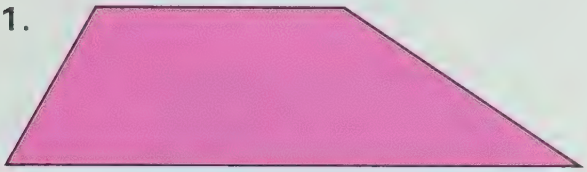
1. measure each angle at a corner.
2. find the sum of the measurements of the angles at a corner.

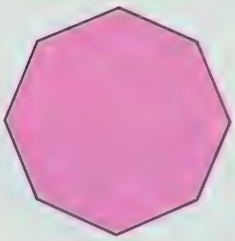
Use tracing paper to help you make a cutout in the shape of this triangle.

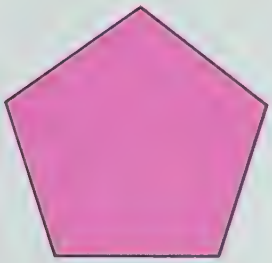
3. Use the cutout and draw a tessellation.
4. Measure each angle at a corner.
5. Find the sum of the measurements of the angles at a corner.

Exercises

Which of these shapes can be used to make tiling patterns that are tessellations?
Use cutouts and draw the tessellations.

1. 

2. 

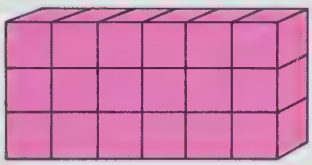
3. 

4.

For each tessellation that you drew,

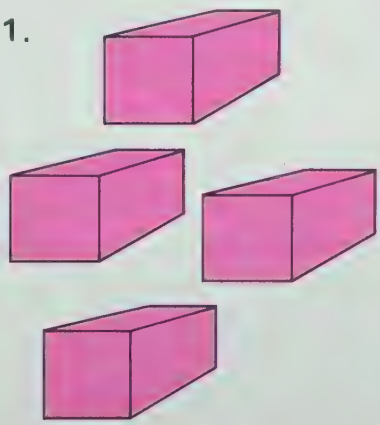
5. find the sum of the measurements of the angles at a corner.

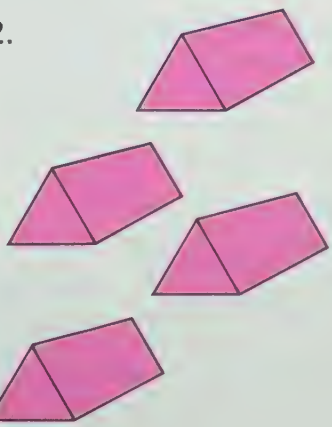
Matching cubes can be stacked to fill a space.

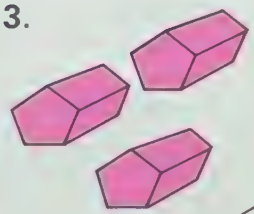


If the bases of prisms can be used to make a tessellation, the prisms can be stacked to fill a space.

Which of these solid shapes can be stacked to fill a space?

1. 

2. 

3. 

try this

Identifying Slide, Flip, and Turn Images in Tiling Patterns

A cutout congruent to the red shape was used to make this tiling pattern.

The blue shape is a slide image of the red shape.

The green shape is a flip image of the red shape.

The yellow shape is a turn image of the red shape.

Working Together

For the tiling pattern above,

1. under what motion is the purple shape an image of the yellow shape?
2. under what motion is the blue shape an image of the purple shape?
3. what shape is a flip image of the blue shape?
4. what shape is a turn image of the white shape?

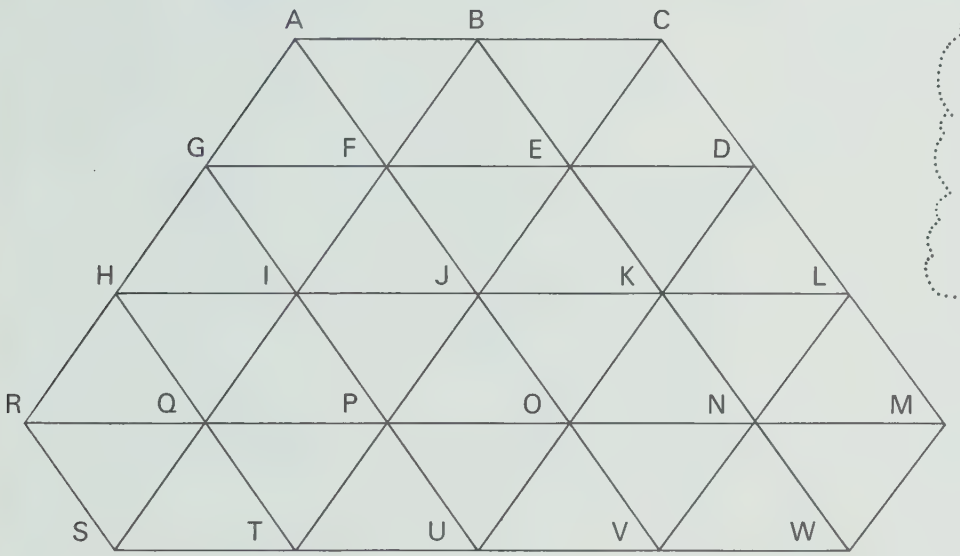
Exercises

For the tiling pattern below, under what motion is

1. △OKJ an image of △EKJ?
2. △IQH an image of △LNK?
3. △IGF an image of △BEF?
4. △JFI an image of △JPI?

In the tiling pattern, name

5. eight triangles that are slide images of △JPI.
6. four triangles that are flip images of △KNO.
7. three triangles that are turn images of △IPQ.
8. two triangles that are slide images of each other.
9. two triangles that are flip images of each other.
10. two triangles that are turn images of each other.



You could use a cutout that is congruent to the triangles in the pattern to help you.

Find the result.

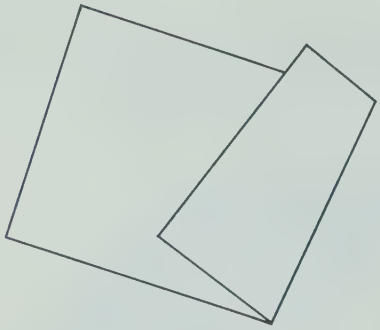
Remember to work inside the parentheses first. Then work from left to right.

1. 7002 − (3981 + 1932)
2. 371.52 ÷ (36 × 24)
3. (2642 ÷ 10) + 493.38
4. (922 × 173) − 63 299
5. 0.87 + (0.83 × 9.1)
6. 6.02 × (3 + 1.25)
7. 700 − (25 370 ÷ 43) + 648
8. 4838 ÷ (400 − 195)
9. (938 + 487.5) ÷ (4.72 + 5.28)
10. (3.71 × 0.92) + 15 − (369 ÷ 36)

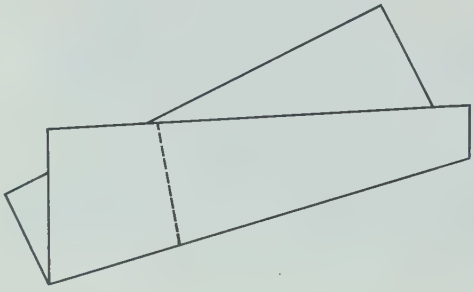
KEEPING SHARP

Working with Models

Fold a piece of paper.



Open it. Fold it again so that one half of the first fold line matches the other half.



Open the paper.

The two fold lines form right angles. The two fold lines are perpendicular.

Try these by folding paper.

1. Draw a line segment. Fold one end point of the line segment onto the other end point. What is special about the fold line and the line segment?
2. Make two folds that cross each other, but do not form right angles. Are any of the angles formed by the two fold lines congruent?

Fold your paper again to check.

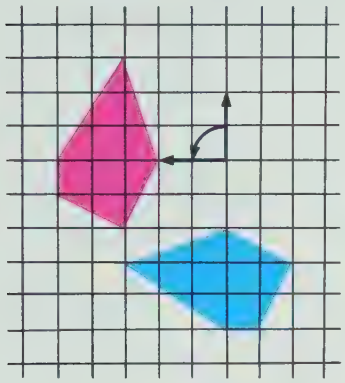
3. Draw an angle. Fold one ray of the angle onto the other ray. What is special about the angles formed by the first angle and the fold line?
4. How can you fold paper to make two parallel fold lines?
5. Fold a piece of paper to make a quadrilateral. Measure the four angles. Add the measurements. Repeat with another quadrilateral. What is special about the sums of the angle measurements?

PROBLEM SOLVING

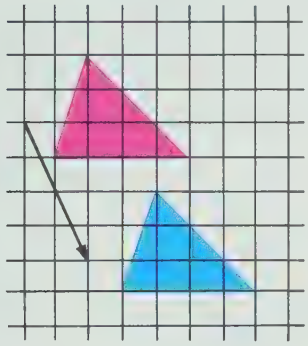
Checking Up

Use tracing paper to test whether

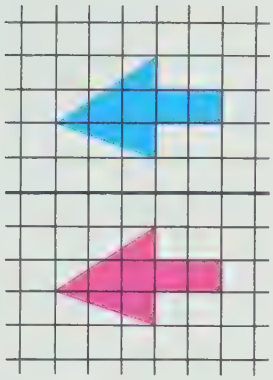
1. the blue shape is the turn image of the red shape for the turn angle shown.



2. the blue shape is the slide image of the red shape for the slide arrow shown.

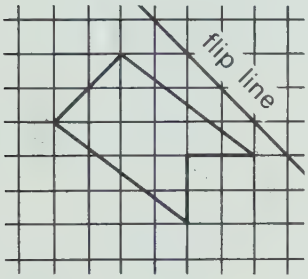


3. the blue shape is the flip image of the red shape for the flip line shown.

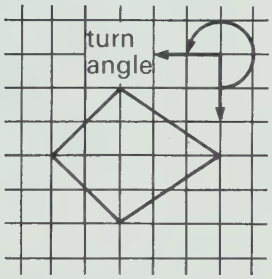


Copy each picture on graph paper.
Use tracing paper to help you draw

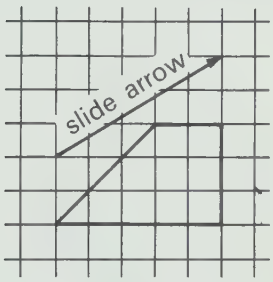
4. the flip image.



5. the turn image.

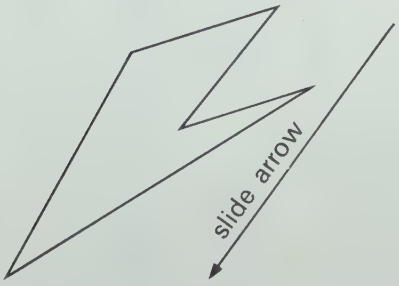


6. the slide image.

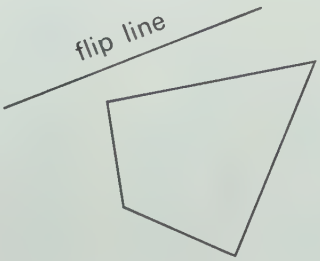


Trace each picture on plain paper.
Use tracing paper to help you draw

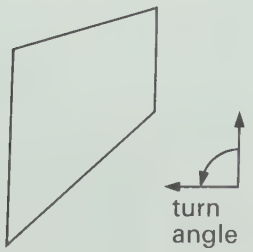
7. the slide image.



8. the flip image.

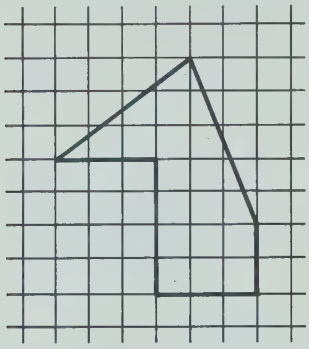


9. the turn image.

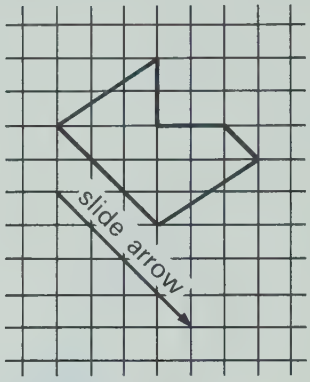


Copy each picture on graph paper.
Without using tracing paper,

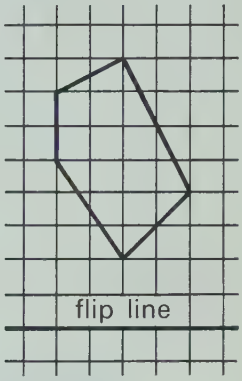
10. draw the slide image for the rule (5L, 4D).



11. write the rule and draw the slide image.



12. draw the flip image.



Use tracing paper to test this shape for turn symmetry. Then give the number of different turns less than a full turn for which the shape fits onto itself.

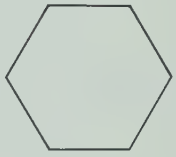
13.

Use a cutout and draw a tiling pattern that is a tessellation. Find the sum of the measurements of the angles at a corner.

Use both of these shapes and draw a pattern without spaces.

14.

15.

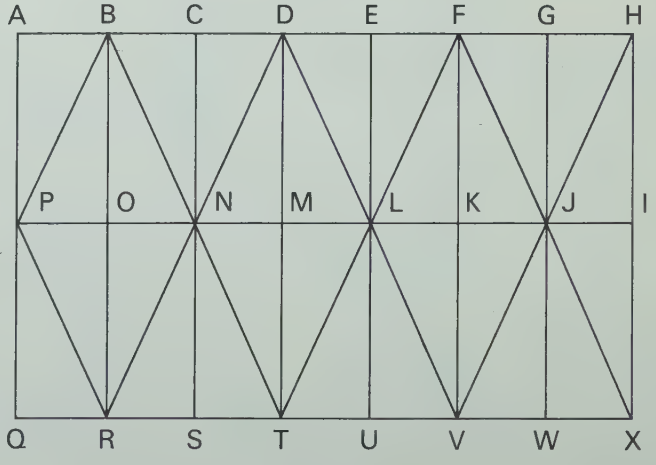


For this tiling pattern,

16. under what motion is △JVK an image of △LFK?

17. name three triangles that are flip images of △MTN.

18. name two triangles that are slide images of each other.



Checking Skills

Divide. Use extra zeros if needed.

1. $61\overline{)\$298.29}$
2. $50\overline{)\$3530}$
3. $10\overline{)\$597.30}$
4. $220\overline{)\$1859}$
5. $84\overline{)\$671.16}$
6. $30\overline{)\$1201.50}$
7. $10\overline{)\$7892}$
8. $49\overline{)\$522.83}$
9. $756\overline{)\$393.12}$
10. $63\overline{)\$635.04}$
11. $200\overline{)\$1670}$
12. $842\overline{)\$791.48}$
13. $35\overline{)\$310.80}$
14. $100\overline{)\$9234}$
15. $78\overline{)7371}$
16. $96\overline{)46.608}$
17. $40\overline{)12.76}$
18. $100\overline{)9.31}$
19. $18\overline{)73.17}$
20. $10\overline{)8.927}$
21. $943\overline{)264.04}$
22. $70\overline{)4.326}$
23. $10\overline{)4302}$
24. $66\overline{)366.3}$
25. $54\overline{)14.85}$
26. $300\overline{)24\,024}$
27. $725\overline{)101.5}$
28. $100\overline{)6090}$
29. $43\overline{)124.7}$
30. $880\overline{)3828}$
31. $\$560 \div 100$
32. $3412 \div 10$
33. $\$24.49 \div 79$
34. $83.08 \div 67$
35. $\$20 \div 400$
36. $61.56 \div 90$
37. $\$6.90 \div 10$
38. $81 \div 20$
39. $\$52.80 \div 60$
40. $99.3 \div 331$
41. $\$10.45 \div 95$
42. $740.6 \div 92$
43. $\$205.20 \div 27$
44. $231 \div 462$
45. $\$624 \div 100$
46. $304 \div 320$
47. $\$2058 \div 600$
48. $2.4 \div 48$

Find the result. Work inside the parentheses first. Then work from left to right.

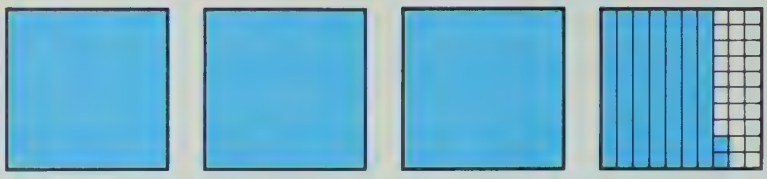
1. $30\,004 - (17\,843 + 12\,048)$
2. $527.25 \div (2.5 \times 38)$
3. $(36\,480 \div 76) - 89$
4. $20 - (343.9 \div 38)$
5. $400.4 \div (37.62 + 12.38)$
6. $(346 \times 84) - 28\,777$
7. $5028 + (94\,564 \div 94)$
8. $7.31 \times (17 - 6.8)$
9. $(3.92 - 3) \times 100$
10. $100 - (1403 \div 46)$
11. $52\,722 \div (1000 - 394)$
12. $10 \times (604 + 209)$
13. $30\,000 - (3496 + 7258)$
14. $27 + (602.58 \div 83)$
15. $2.2 - (0.9 \times 0.71)$
16. $(672 - 589) \times (20\,736 \div 32)$
17. $(63.19 \div 71) + (0.72 \times 1.28)$
18. $(1458 \times 100) \div (100 \times 2.43)$
19. $(3.24 + 6.76) - (300.8 \div 47)$
20. $(100 \times 7920) \div (2098 - 1999)$
21. $(136 \div 16) + 19 + (70 \div 100)$
22. $(106 \times 48) - 4989 - (27 + 30)$
23. $(345.18 + 28.41) \div (39.6 - 27.6)$
24. $(211 \div 25) \times 6.3 - (3.42 \times 10)$
25. $(100 + 61) \times 73 \div (82 + 79)$
26. $64.07 + 32 - (17.1 + 36.428)$
27. $707 \times 30 \div (129.63 - 59.63)$
28. $12 - 8.276 - (142.12 \div 68)$
29. $58\,400 \div 73 + (204 \times 1000)$

15 DIVIDING WITH DECIMALS

Reviewing Place Value

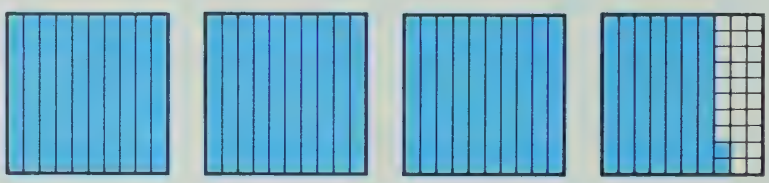
The number 3.72 can represent

ones	tenths	hundredths
3	7	2



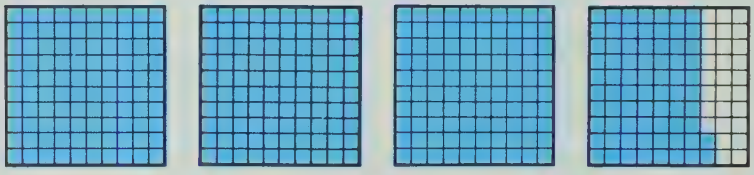
or 3.72 can represent

ones	tenths	hundredths
0	37	2



or 3.72 can represent

ones	tenths	hundredths
0	0	372



Exercises

Copy and complete.

1. 5.89 can represent 5 ones ⬚ tenths 9 hundredths,
or 0 ones ⬚ tenths 9 hundredths,
or 0 ones ⬚ tenths 589 hundredths.

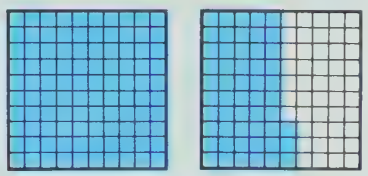
2. 4.8 can represent ⬚ ones 8 tenths,
or 0 ones ⬚ tenths.

3. 0.26 can represent ⬚ ones 2 tenths ⬚ hundredths,
or ⬚ ones 0 tenths ⬚ hundredths.

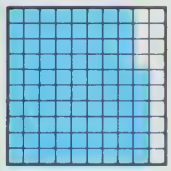
4. 3.76 can represent ⬚ ones 7 tenths 6 hundredths,
or 0 ones ⬚ tenths 6 hundredths,
or 0 ones 0 tenths ⬚ hundredths.

Changing Place Values in Ratios

Give the ratio that compares the blue regions.



1.53 : 0.86
or
15.3 : 8.6
or
153 : 86



If both terms in a ratio are multiplied by the same number to change the place values, the ratios are equivalent.

Multiply by 10
to change to tenths.

$\frac{1.53}{0.86} = \frac{15.3 \text{ tenths}}{8.6 \text{ tenths}}$, or $\frac{15.3}{8.6}$

$\frac{1.53}{0.86} = \frac{15.3}{8.6}$

Multiply both terms of the ratio by 10.

Multiply by 100
to change to hundredths.

$\frac{1.53}{0.86} = \frac{153 \text{ hundredths}}{86 \text{ hundredths}}$, or $\frac{153}{86}$

$\frac{1.53}{0.86} = \frac{153}{86}$

Multiply both terms of the ratio by 100.

Exercises

In both terms of the ratio, change the place value in the same way to get an equivalent ratio.

1. $\frac{2.17}{3.68} = \frac{21.7}{\blacksquare}$
2. $\frac{7.63}{4.18} = \frac{\blacksquare}{418}$
3. $\frac{2.9}{3.2} = \frac{29}{\blacksquare}$
4. $\frac{0.64}{0.82} = \frac{\blacksquare}{82}$
5. $\frac{3.8}{1.75} = \frac{\blacksquare}{17.5}$
6. $\frac{0.95}{1.2} = \frac{95}{\blacksquare}$
7. $\frac{7.641}{1.8} = \frac{\blacksquare}{180}$
8. $\frac{3}{4.5} = \frac{30}{\blacksquare}$
9. $\frac{0.07}{0.82} = \frac{7}{\blacksquare}$
10. $\frac{36}{0.18} = \frac{\blacksquare}{1.8}$
11. $\frac{4}{1.75} = \frac{400}{\blacksquare}$
12. $\frac{3.282}{7.64} = \frac{\blacksquare}{764}$
13. $\frac{95.4}{36.2} = \frac{\blacksquare}{362}$
14. $\frac{0.182}{0.006} = \frac{18.2}{\blacksquare}$
15. $\frac{5.6}{1.37} = \frac{\blacksquare}{13.7}$
16. $\frac{5.308}{2} = \frac{5308}{\blacksquare}$

Dividing by Numbers Less Than 1

There are 15 kg of cheese in the large block. It will be cut into smaller blocks that are about 0.5 kg each. About how many smaller blocks will there be?

Divide 15 by 0.5.

For $0.5\overline{)15}$,

think: 5 tenths$\overline{)}$150 tenths

Use $5\overline{)150}$. (30)

Both the divisor and the dividend are multiplied by 10.

150 tenths ÷ 5 tenths = 30

15 ÷ 0.5 = 30

Check by multiplying:
0.5 × 30 = 15.0, or 15

There will be about 30 smaller blocks of cheese.

> If the divisor and the dividend are multiplied by the same number to change the place values, the quotient remains the same.

You can use this rule to replace decimal divisors with whole numbers.

Take another look:

For $0.5\overline{)3.5}$, think 5 tenths$\overline{)}$35 tenths.

Use $5\overline{)35}$. (7)

$$0.5\overline{)3.5} \quad 7$$

3.5 ÷ 0.5 = 7

Check: 0.5 × 7 = 3.5

Working Together

Copy each of these. Change place values in the dividend to match the change in the divisor.

1. $0.4\overline{)1.6}$ **2.** $0.2\overline{)5.0}$ **3.** $0.9\overline{)34.2}$ **4.** $0.5\overline{)7}$

For each of these, change both numbers so that the divisor is a whole number.

Change place values in the divisor first to get a whole number. Then make a matching change in the dividend.

5. $0.3\overline{)2.1}$ **6.** $0.8\overline{)28.0}$ **7.** $0.6\overline{)16.2}$ **8.** $0.7\overline{)35}$

Change place values in the divisor and dividend in the same way. Divide. Then check by multiplying.

9. $0.4\overline{)3.6}$ **10.** $0.9\overline{)28.8}$ **11.** $0.8\overline{)36}$ **12.** $0.7\overline{)42}$

Exercises

Divide. Check by multiplying.

1. $0.2\overline{)2.8}$ **2.** $0.5\overline{)16}$ **3.** $0.3\overline{)9.6}$ **4.** $0.4\overline{)10}$

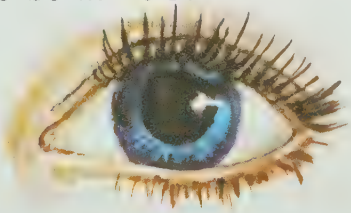
5. $0.6\overline{)15.6}$ **6.** $0.1\overline{)4.3}$ **7.** $0.2\overline{)13}$ **8.** $0.9\overline{)16.2}$

9. $0.8\overline{)12}$ **10.** $0.3\overline{)12}$ **11.** $0.6\overline{)3}$ **12.** $0.7\overline{)1.4}$

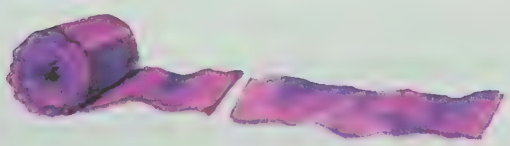
Solve.

13 The capacity of each glass is 0.6 L. How many glasses can be filled from the pitcher?

14. A blink takes 0.4 s. How many blinks could there be in 10 s?



15. How many pieces of crepe paper 0.5 m long could be cut from a piece 14 m long?



16. Each board is 0.1 m wide. How many boards are needed to cover 5.6 m when placed side by side?

Dividing with Tenths

The gasoline tank in the car holds 55.2 L. The car uses 4.8 L of gasoline for each round trip to school.
How many round trips are possible on a full tank?

Divide 55.2 by 4.8.

For $4.8\overline{)55.2}$,

think: 48 tenths$\overline{)552 \text{ tenths}}$

Use $4.8\overline{)55.2}$

$$\begin{array}{r} 11.5 \\ 48\overline{)552} \\ 72 \\ 48 \\ \hline 240 \\ 240 \\ \hline 0 \end{array}$$

Check by multiplying:

$$\begin{array}{r} 11.5 \\ \times\ 4.8 \\ \hline 920 \\ 4600 \\ \hline 55.20 \end{array}$$

11 round trips are possible on a full tank.

Working Together

Copy each of these. Change place values in the dividend to match the change in the divisor.

1. $1.4\overline{)4.9}$ **2.** $3.6\overline{)7.74}$ **3.** $2.4\overline{)1.8}$ **4.** $1.5\overline{)54}$

Change place values in the divisor and dividend in the same way. Divide. Then check by multiplying.

5. $3.8\overline{)25.65}$ **6.** $7.1\overline{)639}$ **7.** $1.2\overline{)0.78}$ **8.** $4.5\overline{)0.126}$

Exercises

Divide. Check by multiplying.

1. $3.2\overline{)56.32}$ **2.** $1.7\overline{)1.02}$ **3.** $2.5\overline{)0.2}$ **4.** $9.6\overline{)336}$

5. $5.4\overline{)5.535}$ **6.** $0.8\overline{)1.3}$ **7.** $3.9\overline{)12.012}$ **8.** $1.4\overline{)2464}$

9. $2.1\overline{)84}$ **10.** $1.6\overline{)0.12}$ **11.** $0.1\overline{)0.53}$ **12.** $3.3\overline{)0.264}$

13. $4.2\overline{)86.1}$ **14.** $7.9\overline{)23.7}$ **15.** $3.5\overline{)637}$ **16.** $1.8\overline{)5.13}$

When a number is divided by 0.1, each digit moves one place to the left.

Example:

$$\begin{array}{c|c|c|c} \text{tens} & \text{ones} & \text{tenths} & \text{hundredths} \\ \hline 8 & 2 & 9 & \end{array} \div 0.1 = \begin{array}{c|c|c|c} \text{tens} & \text{ones} & \text{tenths} & \text{hundredths} \\ \hline 8 & 2 & 9 & \end{array}$$

$$0.1\overline{)8.29} \quad 82.9$$

Divide each number by 0.1.
Write only the quotients.

17. 9.2 **18.** 6.21 **19.** 0.08 **20.** 7 **21.** 64.05 **22.** 8.716

Show the first 6 members of each pattern.

1.

•	• • / • •	• • • / • • • / • • •	?	?	?

2.

1	4	9	?	?	?

3.

•	• / • •	• / • • / • • •	?	?	?

4.

1	3	6	?	?	?

5. Draw the 8th member of the patterns in Exercises 1 and 3.

6. Find the 12th member of the patterns in Exercises 2 and 4.

try this

Rounding Quotients

Casey's mother bought 3.2 m of cloth for $10.18.
How much did each metre of cloth cost?

To find the price of each metre, divide 10.18 by 3.2.

For $3.2\overline{)10.18}$, use $3.2\overline{)10.180}$

$$\begin{array}{r} 3.181 \\ 3.2\overline{)10.180} \\ 96 \\ \hline 58 \\ 32 \\ \hline 260 \\ 256 \\ \hline 40 \\ 32 \\ \hline 8 \end{array}$$

Each metre of cloth cost $3.18.

Since the quotient means an amount of money, round it to two decimal places.

3.181 rounds to 3.18.

Multiply 3.18 by 3.2 to check.

If the product is not close to the dividend, there is a mistake in your work.

Exercises

Divide. Round each quotient to the nearest tenth.

1. $0.4\overline{)0.547}$ **2.** $2.3\overline{)795}$ **3.** $0.7\overline{)0.622}$ **4.** $1.9\overline{)122}$

5. $3.9\overline{)7.606}$ **6.** $0.3\overline{)1475}$ **7.** $2.8\overline{)0.26}$ **8.** $0.5\overline{)1.0234}$

Divide. Round each quotient to the nearest hundredth.

9. $0.4\overline{)0.547}$ **10.** $2.3\overline{)795}$ **11.** $0.7\overline{)0.622}$ **12.** $1.9\overline{)122}$

13. $4.5\overline{)1758}$ **14.** $0.6\overline{)0.05}$ **15.** $3.2\overline{)35}$ **16.** $0.9\overline{)4.17}$

Divide. Round each quotient to the nearest thousandth.

17. $0.4\overline{)0.547}$ **18.** $2.3\overline{)795}$ **19.** $0.7\overline{)0.622}$ **20.** $1.9\overline{)122}$

21. $1.7\overline{)6.53}$ **22.** $0.3\overline{)22.7}$ **23.** $3.4\overline{)1.01}$ **24.** $0.7\overline{)487}$

Solve.

25. Craig needs 0.9 m of cloth to make each pair of overalls. He has 3.5 m of cloth. How many pairs of overalls can he make?

***26.** Jenny used 0.8 m of denim to make a skirt. She had 7.5 m of denim left. How many skirts could she make in all?

Practice

Divide. Check by multiplying.

1. $0.2\overline{)1.2}$ **2.** $0.4\overline{)14}$ **3.** $0.5\overline{)2.56}$ **4.** $0.6\overline{)0.09}$

5. $4.7\overline{)8.46}$ **6.** $1.2\overline{)0.726}$ **7.** $2.8\overline{)9.45}$ **8.** $3.5\overline{)9.59}$

Divide. Show each quotient rounded to the nearest thousandth, the nearest hundredth, and the nearest tenth.

9. $3.2\overline{)4.13}$ **10.** $0.8\overline{)4.4444}$ **11.** $1.4\overline{)0.64}$ **12.** $0.6\overline{)3.7}$

13. $0.3\overline{)3.605}$ **14.** $2.7\overline{)10}$ **15.** $0.5\overline{)0.0373}$ **16.** $4.9\overline{)4.8}$

When a number is →	multiplied by 10,	divided by 10,	multiplied by 0.1,	divided by 0.1,
each digit moves one place to →	the left.	the right.	the right.	the left.

Complete this sentence in two ways.

17. __?__ a number by __?__ gives the same result as __?__ the number by __?__.

Divide or multiply.
Write only the results.

18. 4.62×10 **19.** $3.7 \div 10$ **20.** 75×0.1 **21.** $0.9 \div 0.1$

22. $6.29 \div 10$ **23.** $10 \div 0.1$ **24.** 0.1×10 **25.** 5.03×0.1

The pages of this book are numbered from 2 to 346.

If the pages of this book were numbered to 578, tell whether each of these pages would be on the left side or on the right side of the book.

1. 524 **2.** 420 **3.** 397 **4.** 477

5. Are more of the page numbers odd or are more even?

6. How many digits are used to show the page numbers from 2 to 346?

7. Are more of the digits odd or are more even?

PROBLEM SOLVING

Dividing with Hundredths

Mona spent \$7 on 14¢ stamps.
How many stamps did she buy?

Divide 7 by 0.14.

For $0.14\overline{)7}$,

think (14 hundredths)$\overline{)700 \text{ hundredths}}$.

Use $0.14\overline{)7.00}$

$$\begin{array}{r} 50 \\ 14\overline{)700} \\ 70 \\ \hline 00 \end{array}$$

Multiply 50 by 0.14 to check.

Mona bought 50 stamps.

Working Together

Copy each of these. Change place values in the dividend to match the change in the divisor.

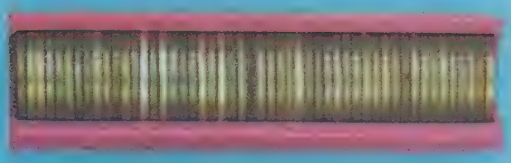
1. $0.23\overline{)1.38}$ **2.** $1.46\overline{)21.9}$ **3.** $0.08\overline{)0.4}$ **4.** $2.25\overline{)81}$

Change place values in the divisor and dividend in the same way. Divide. Then check by multiplying.

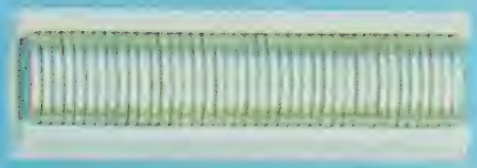
5. $9.37\overline{)37.48}$ **6.** $0.54\overline{)13.5}$ **7.** $0.01\overline{)3.2}$ **8.** $5.65\overline{)452}$

Exercises

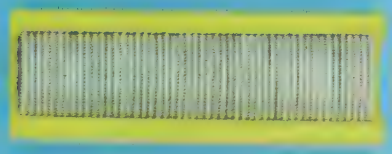
Divide



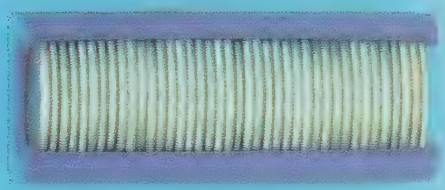
1. 0.5 by 0.01 to find how many pennies are in the $0.50 roll of pennies.



2. 2 by 0.05 to find how many nickels are in the $2 roll of nickels.



3. to find how many dimes are in the $5 roll.



4. to find how many quarters are in the $10 roll.

Divide. Check by multiplying.

5. $0.75\overline{)28.5}$	**6.** $0.09\overline{)5.85}$	**7.** $1.86\overline{)102.3}$	**8.** $3.18\overline{)31.8}$
9. $1.46\overline{)73}$	**10.** $0.95\overline{)85.5}$	**11.** $2.79\overline{)19.53}$	**12.** $6.25\overline{)100}$
13. $2.03\overline{)223.3}$	**14.** $0.25\overline{)7}$	**15.** $0.33\overline{)4.95}$	**16.** $4.62\overline{)207.9}$
17. $0.07\overline{)35}$	**18.** $3.83\overline{)72.77}$	**19.** $3.35\overline{)67}$	**20.** $0.99\overline{)98.01}$

Solve.

21. Each metre of wire cost $0.30. Mr. Granville paid $2.10 for a roll of wire. How many metres of wire were in the roll?

22. The oranges cost $1.45 for each kilogram. The tag on the bag showed $5.80. How many kilograms of oranges were in the bag?

23. Mrs. Bankes bought $8.16 worth of gasoline. Each litre cost $0.24. How many litres did she buy?

24. Sandy charges $0.75 for each hour that she babysits. Last Saturday she earned $4.50. How many hours did she work?

Dividing with Tenths, Hundredths, Thousandths

Five letter-sorting machines sort letters at the post office. They take about 0.033 s to handle each letter. About how many letters can be sorted in 1 min?

There are 60 s in 1 min.

Divide 60 by 0.033.

For $0.033\overline{)60}$,

$$
\begin{array}{r}
1\,818.1 \\
0.033\overline{)60.000} \\
33 \\
\hline
270 \\
264 \\
\hline
60 \\
33 \\
\hline
27
\end{array}
$$

1818.1 rounds to 1818.

About 1818 letters can be sorted in 1 min.

Working Together

Copy each of these. Change place values in the dividend to match the change in the divisor.

1. $0.009\overline{)0.0603}$ **2.** $2.4\overline{)9.3}$ **3.** $3.75\overline{)60}$ **4.** $0.068\overline{)30.6}$

Change place values in the divisor and dividend in the same way. Divide. Then check by multiplying.

5. $7.6\overline{)15.58}$ **6.** $0.04\overline{)7}$ **7.** $4.18\overline{)2.717}$ **8.** $0.125\overline{)0.1}$

Divide. Check by multiplying.

4. $0.7\overline{)0.84}$

5. $2.6\overline{)7.28}$

6. $0.08\overline{)0.2}$

7. $3.2\overline{)3952}$

8. $6.6\overline{)21.78}$

9. $0.04\overline{)0.05}$

10. $0.8\overline{)2.4}$

11. $6.73\overline{)2.692}$

12. $5.08\overline{)1.778}$

13. $0.75\overline{)21}$

14. $0.027\overline{)0.0594}$

15. $3.68\overline{)176.64}$

16. $0.4\overline{)426}$

17. $0.04\overline{)120.4}$

18. $6.5\overline{)24.96}$

19. $0.006\overline{)0.003}$

20. $0.39\overline{)2.73}$

21. $17.4\overline{)2784}$

22. $0.065\overline{)0.2132}$

23. $12.5\overline{)177.5}$

24. $4.6\overline{)18.308}$

25. $0.25\overline{)22}$

Exercises

Solve.

1. The stamps on letters are canceled with a machine at the post office. It takes about 0.11 s to cancel each letter. About how many letters can be canceled in 1 min?

2. Each box costs \$1.48 to mail. The total postage bill was \$23.68. How many boxes were mailed?

3. A store mailed letters to its customers. The mass of each letter was about 20.9 g. The mass of all the letters was about 19.6 kg. About how many letters were there?

When a number is divided by 0.01, each digit moves 2 places to the left. When it is divided by 0.001, each digit moves 3 places to the left.

Examples:

$2.5 \div 0.01 = 250$

$0.0075 \div 0.001 = 7.5$

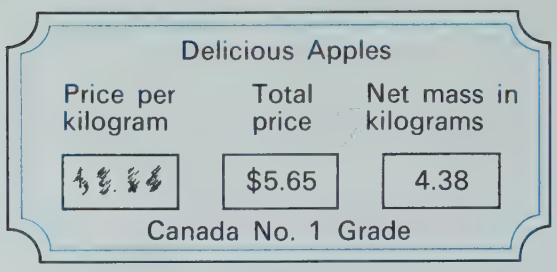
Divide each number by 0.1, 0.01, and 0.001. Write only the quotients.

26. 1.8 **27.** 7 **28.** 0.9

29. 3.06 **30.** 4.928 **31.** 0.065

Rounding Quotients

The price per kilogram is blurred on the price tag.
To find the price per kilogram, divide 5.65 by 4.38.



For $4.38\overline{)5.65}$, use $4.38\overline{)5.65000}$

$$
\begin{array}{r}
1.289 \\
4.38\overline{)5.65000} \\
\underline{4\,38} \\
1\,27\,0 \\
\underline{87\,6} \\
39\,40 \\
\underline{35\,04} \\
4\,360 \\
\underline{3\,942} \\
418
\end{array}
$$

Since the quotient means an amount of money, round it to two decimal places.

1.289 rounds to 1.29.

The price per kilogram for the apples is $1.29.

Multiply 1.29 by 4.38 to check.

If the product is not close to the dividend, there is a mistake in your work.

Exercises

Divide. Round each quotient to the nearest tenth.

1. $0.08\overline{)0.237}$ **2.** $3.14\overline{)8.639}$ **3.** $0.007\overline{)65}$ **4.** $0.471\overline{)1.83}$

Divide. Round each quotient to the nearest hundredth.

5. $0.08\overline{)0.237}$ **6.** $3.14\overline{)8.639}$ **7.** $1.95\overline{)76}$ **8.** $0.7\overline{)9.26}$

Divide. Round each quotient to the nearest thousandth.

9. $0.08\overline{)0.237}$ **10.** $3.14\overline{)8.639}$ **11.** $6.7\overline{)29.308}$ **12.** $0.085\overline{)12}$

Solve.

13. 2.38 kg of meat cost $5.88. To the nearest cent, how much did each kilogram cost?

14. Each kilogram of grapes costs $3.50. To the nearest kilogram, what mass of grapes can be bought for $7.55?

15. 3.6 kg of peanuts cost $7.67. To the nearest cent, how much did each kilogram of peanuts cost?

***16.** Each 500 g of walnuts costs $2.20. To the nearest kilogram, what mass of walnuts can be bought for $4.66?

Practice

Divide. Check by multiplying.

1. $7.64\overline{)133.7}$ **2.** $6.6\overline{)16.863}$ **3.** $0.725\overline{)6.09}$ **4.** $6.5\overline{)36.4}$

5. $0.24\overline{)6}$ **6.** $0.375\overline{)18}$ **7.** $2.16\overline{)83.16}$ **8.** $0.008\overline{)0.1}$

Divide. Show each quotient rounded to the nearest tenth, the nearest hundredth, and the nearest thousandth.

9. $0.9\overline{)26}$ **10.** $6.37\overline{)26.2}$ **11.** $0.54\overline{)7.3}$ **12.** $5.6\overline{)18.75}$

When a number is → / each digit moves 1, 2, or 3 places to →	multiplied by 10, 100, or 1000,	divided by 10, 100, or 1000,	multiplied by 0.1, 0.01, or 0.001,	divided by 0.1, 0.01, or 0.001,
	the left.	the right.	the right.	the left.

Complete this sentence in two ways.

13. __?__ a number by __?__ gives the same result as __?__ the number by __?__.

Divide or multiply.
Write only the results.

14. 3.8×0.1 **15.** $3.8 \div 10$ **16.** 6.2×100 **17.** $6.2 \div 0.01$

18. $0.075 \div 0.1$ **19.** 0.075×10 **20.** $4160 \div 1000$ **21.** 4160×0.001

22. 84.5×0.01 **23.** $84.5 \div 100$ **24.** 2.63×1000 **25.** $2.63 \div 0.001$

In this game,

a penny may move to the right only;
a nickel may move to the left only;
a penny may jump over a single nickel;
a nickel may jump over a single penny.
Each may only move into an empty space.

1. Start with pennies and nickels as shown. Follow the rules and move them so that they change places.

PROBLEM SOLVING

Estimating Quotients

When estimating a quotient, first change the divisor to a one-digit number. Then change the dividend to a multiple of that number.

If the divisor and the dividend are multiplied by the same number, the quotient remains the same.

For $0.29\overline{)1.827}$,

$0.2\,9\overline{)1.8\,27}$

estimate $3\overline{)18}$

18 is a multiple of 3.

$18 \div 3 = 6$

$1.827 \div 0.29$ is about 6.

$$\begin{array}{r} 6.3 \\ 0.29\overline{)1.82\,7} \\ 1\,74 \\ \hline 8\,7 \\ 8\,7 \\ \hline 0 \end{array}$$

$1.827 \div 0.29 = 6.3$

For $38.5\overline{)207.9}$,

$3\,8.5\overline{)20\,7.9}$

estimate $4\overline{)20}$

20 is a multiple of 4.

$20 \div 4 = 5$

$207.9 \div 38.5$ is about 5.

$$\begin{array}{r} 5.4 \\ 38.5\overline{)207.9} \\ 192\,5 \\ \hline 15\,4\,0 \\ 15\,4\,0 \\ \hline 0 \end{array}$$

$207.9 \div 38.5 = 5.4$

For $62\overline{)2511}$,

$6\,2.\overline{)251\,1.}$

estimate $6\overline{)240}$

240 is a multiple of 6.

$240 \div 6 = 40$

$2511 \div 62$ is about 40.

$$\begin{array}{r} 40.5 \\ 62\overline{)2511.0} \\ 248 \\ \hline 31\,0 \\ 31\,0 \\ \hline 0 \end{array}$$

$2511 \div 62 = 40.5$

Working Together

Round each divisor to a whole number between 1 and 10. Then change each dividend to show a multiple of the divisor.

Example: For $7.6\overline{)0.479}$,

estimate $8\overline{)0.48}$ (48 is a multiple of 8.)

1. $2.4\overline{)7.95}$ **2.** $5.8\overline{)3.427}$ **3.** $7.15\overline{)342}$

Change place values in the divisor and in the dividend to get a divisor between 1 and 10. Then round the divisor to a whole number and change the dividend to show a multiple of the divisor.

Example: $0.06\,8\overline{)41.40}$ becomes $7\overline{)4200}$

4. $0.52\overline{)3.6}$ **5.** $38.5\overline{)7.72}$ **6.** $62\overline{)1.7}$

Estimate each quotient.

7. $0.43\overline{)1.11}$ **8.** $68\overline{)22.5}$ **9.** $83.7\overline{)49.9}$

Exercises

Estimate each quotient.

1. $2.1\overline{)15.9}$ **2.** $61\overline{)4100}$ **3.** $0.482\overline{)3.14}$

4. $9.2\overline{)250}$ **5.** $0.72\overline{)13.5}$ **6.** $48\overline{)9.81}$

7. $19\overline{)997}$ **8.** $0.88\overline{)0.71}$ **9.** $38\overline{)27.1}$

10. $0.081\overline{)0.43}$ **11.** $6.75\overline{)1.493}$ **12.** $26\overline{)107}$

13. $0.79\overline{)5.7}$ **14.** $0.29\overline{)0.273}$ **15.** $5.7\overline{)4.6}$

16. $0.038\overline{)0.015}$ **17.** $4.08\overline{)35.75}$ **18.** $0.07\overline{)0.062}$

19. $0.058\overline{)0.288}$ **20.** $76\overline{)4767}$ **21.** $6.4\overline{)5.478}$

22. $4.9\overline{)2.49}$ **23.** $31.7\overline{)187.2}$ **24.** $78\overline{)632}$

Solving Problems Without Pencil and Paper

The 30 students in Hugh's class sold tickets for the school concert. The average number of tickets that each of them sold was 23 for the afternoon performance and 27 for the evening performance. How many tickets did they sell in all?

To find the number of tickets, think

$(30 \times 23) + (30 \times 27)$

$= 30 \times (23 + 27)$, or

30×50, or 1500

30 groups of 23 and 30 groups of 27 are the same as 30 groups of 50.

$(30 \times 23) + (30 \times 27)$

$= 690 + 810$, or 1500

They sold 1500 tickets in all.

Write only the concluding statements.

1. Barry's class used 12 boxes of 64 lead pencils and 12 boxes of 36 colored pencils this year. How many pencils did they use this year?
2. Meg's class of 32 students went to a play. It cost $1.25 each for admission and $0.75 each for transportation. What was the total cost of the trip?
3. The 31 students in Sara's class and the 29 students in Carl's class worked on a bulletin board from 13:45 to 15:45. How many "student-hours" were spent on the bulletin board?
4. Nina's class of 25 students worked on a mural from 09:00 to 10:25 and from 14:00 to 15:35. How many "student-hours" were spent on the mural?
5. Four students carried books from their classroom to the library. They carried 17 novels each having a mass of 0.425 kg and 17 science books each having a mass of 0.575 kg. What was the mass of all the books they carried?
6. Alan's class bought 12 cans of orange juice, 17 cans of grape juice, and 11 cans of apple juice to sell at the field day. Each can contained 1.5 L of juice. How many millilitres of juice did they buy?

PROBLEM SOLVING

Checking Up

Divide.

1. $0.3\overline{)0.21}$ **2.** $0.8\overline{)49.3}$ **3.** $0.4\overline{)3}$

4. $8.3\overline{)39.01}$ **5.** $2.7\overline{)9.882}$ **6.** $0.007\overline{)0.644}$

7. $0.425\overline{)5.78}$ **8.** $0.02\overline{)0.759}$ **9.** $0.05\overline{)0.8}$

10. $0.38\overline{)0.171}$ **11.** $9.4\overline{)32.9}$ **12.** $0.075\overline{)2.4}$

13. $0.75\overline{)39}$ **14.** $0.608\overline{)1.52}$ **15.** $0.6\overline{)0.072}$

16. $0.49\overline{)24.5}$ **17.** $5.42\overline{)81.3}$ **18.** $0.7\overline{)3.948}$

19. $8.27\overline{)30.599}$ **20.** $0.62\overline{)1.55}$ **21.** $0.08\overline{)0.68}$

22. $9.35\overline{)59.84}$ **23.** $0.09\overline{)0.063}$ **24.** $7.92\overline{)396}$

Divide. Round each quotient to the nearest tenth.

25. $0.6\overline{)8}$ **26.** $5.3\overline{)28.4}$ **27.** $2.55\overline{)7.1}$ **28.** $0.22\overline{)7.97}$

Divide. Round each quotient to the nearest hundredth.

29. $0.3\overline{)7.61}$ **30.** $9.7\overline{)6}$ **31.** $4.17\overline{)75}$ **32.** $0.96\overline{)0.65}$

Divide. Round each quotient to the nearest thousandth.

33. $0.8\overline{)3.627}$ **34.** $7.4\overline{)3.9}$ **35.** $8.94\overline{)0.495}$ **36.** $0.68\overline{)3.8}$

Divide or multiply. Write only the results.

37. 2.6×100 **38.** 0.06×0.1 **39.** $38 \div 0.01$

40. $1.63 \div 100$ **41.** $750 \div 1000$ **42.** 24.6×10

43. $4 \div 0.1$ **44.** 4.1×1000 **45.** $60.02 \div 10$

46. 0.4×0.01 **47.** $25.48 \div 0.001$ **48.** 16×0.001

49. 0.007×1000 **50.** 8×0.001 **51.** $3.5 \div 10$

Solve.

52. Each kilogram of plums costs \$2.24. How many kilograms of plums can be bought for \$3.36?

53. Lia needs 0.18 m of ribbon to make one bookmark. How many bookmarks can she make with 0.3 m of ribbon?

16 INTEGERS

Writing Integers

The numbers used before "ignition" are **negative integers**.
The numbers used after "ignition" are **positive integers**.

Ignition!

A positive integer is written with the symbol $^{+}$.

$^{+}2$ should be read "positive 2".

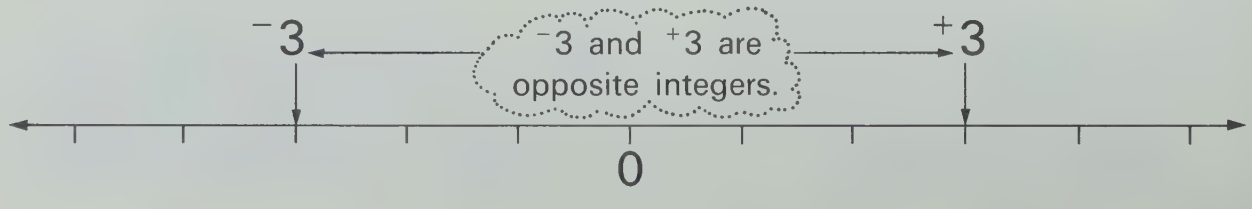
A negative integer is written with the symbol $^{-}$.

$^{-}5$ should be read "negative 5".

0 is an integer that is neither positive nor negative.

Each positive integer has an opposite negative integer.
Each negative integer has an opposite positive integer.

On the number line, points for opposite integers are the same distance from 0 but in opposite directions.



Lift-off!

$^{+}1$ $^{+}2$ $^{+}3$ $^{+}4$ $^{+}5$ $^{+}6$ $^{+}7$ $^{+}8$

Exercises

Use "positive" or "negative" to complete each sentence.

1. $^{-}8$ is a ___?___ integer.

2. $^{+}1$ is a ___?___ integer.

3. List the first 10 integers greater than 0. These are the first 10 ___?___ integers.

4. List the opposites of the 10 integers listed for Exercise 3. These are ___?___ integers.

Jesse and Joanna played a game. Whenever either scored a positive number of points, the other scored the opposite number.

5. When Jesse scored $^{+}6$ points, how many did Joanna score?

6. When Joanna scored $^{-}2$ points, how many did Jesse score?

Solve.

7. On April 30, the lake level was 37 cm above normal. How much would the level need to change to bring it to normal? Would it need to rise or fall?

8. On September 30, the lake level was 31 cm below normal. How much would the level need to change to bring it to normal? Would it need to rise or fall?

Comparing and Ordering Integers

The number line can help you compare integers.

Numerals for negative integers always show the symbol $^-$.

Numerals for positive integers do not always show the symbol $^+$. Positive integers are the same as whole numbers.

For any two points on a horizontal number line, the integer for the point to the left is less than the integer for the point to the right.

On the number line,

$^+2$ is to the left of $^+4$, so $^+2 < {}^+4$.

$^-2$ is to the left of $^+4$, so $^-2 < {}^+4$.

$^+2$ is to the right of $^-4$, so $^+2 > {}^-4$.

$^-2$ is to the right of $^-4$, so $^-2 > {}^-4$.

Working Together

Complete.

1.

2.

3. $^-9$, $^-8$, ▒, ▒, ▒, $^-4$

4. $^-5$, ▒, ▒, ▒, $^-1$, ▒

Which integer in each pair would be placed farther to the right on the number line?

5. $^+9$, $^+7$ **6.** $^-1$, $^-3$ **7.** $^+8$, $^-8$ **8.** $^-5$, 0

Use $>$ or $<$ to make true statements.

9. $^+9$ ◍ $^+7$ **10.** $^-1$ ◍ $^-3$ **11.** $^+8$ ◍ $^-8$ **12.** $^-5$ ◍ 0

List from least to greatest.

13. $^+3$, $^-3$, $^+7$, $^-7$, $^+1$, $^-1$

List from greatest to least.

14. $^-4$, $^+2$, $^-1$, 0, $^-6$, $^+5$

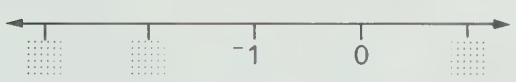
Exercises

Complete.

1.

2.

3.

4. 

5.

6.

7. $^{+}6$, $^{+}7$, ▒, ▒, ▒, $^{+}11$

8. $^{-}10$, ▒, ▒, $^{-}7$, ▒, ▒

9. ▒, ▒, ▒, $^{+}3$, ▒, $^{+}5$

10. ▒, $^{-}3$, $^{-}2$, ▒, ▒, ▒

Use $>$ or $<$ to make true statements.

11. $^{-}5$ ◯ $^{+}4$

12. $^{+}2$ ◯ 0

13. $^{+}3$ ◯ $^{+}7$

14. $^{-}3$ ◯ $^{-}1$

15. $^{+}3$ ◯ $^{-}6$

16. $^{-}2$ ◯ $^{+}2$

17. $^{-}5$ ◯ 0

18. $^{+}1$ ◯ $^{-}7$

19. $^{-}8$ ◯ $^{-}7$

20. $^{+}4$ ◯ $^{+}1$

21. $^{-}4$ ◯ $^{-}9$

22. $^{-}2$ ◯ $^{-}5$

List from least to greatest.

23. $^{+}5$, $^{-}5$, $^{-}8$, $^{+}8$, $^{+}9$, $^{-}9$

24. $^{+}3$, $^{+}4$, $^{-}1$, $^{-}8$, $^{-}4$, $^{+}1$

25. 0, $^{-}1$, $^{+}2$, $^{-}3$, $^{+}4$, $^{-}5$

26. $^{+}6$, $^{-}3$, $^{+}1$, $^{+}5$, $^{-}6$, $^{-}2$

List from greatest to least.

27. $^{-}6$, $^{+}6$, $^{-}4$, $^{+}4$, $^{-}2$, $^{+}2$

28. $^{+}2$, $^{-}7$, $^{-}5$, 0, $^{-}2$, $^{+}3$

29. $^{-}5$, 0, $^{-}2$, $^{-}3$, $^{+}7$, $^{-}1$

30. 0, $^{+}3$, $^{-}6$, $^{+}2$, $^{+}4$, $^{-}1$

When all the factors in a product are the same, the product can be shown using **exponents**.

An exponent shows how many times a number is used as a factor.

$5 \times 5 = 5^2$ ← exponent → $3^5 = 3 \times 3 \times 3 \times 3 \times 3$

Show each of these using exponents.

1. $8 \times 8 \times 8$ **2.** $6 \times 6 \times 6 \times 6$ **3.** $4 \times 2 \times 2$ **4.** 36 **5.** 27

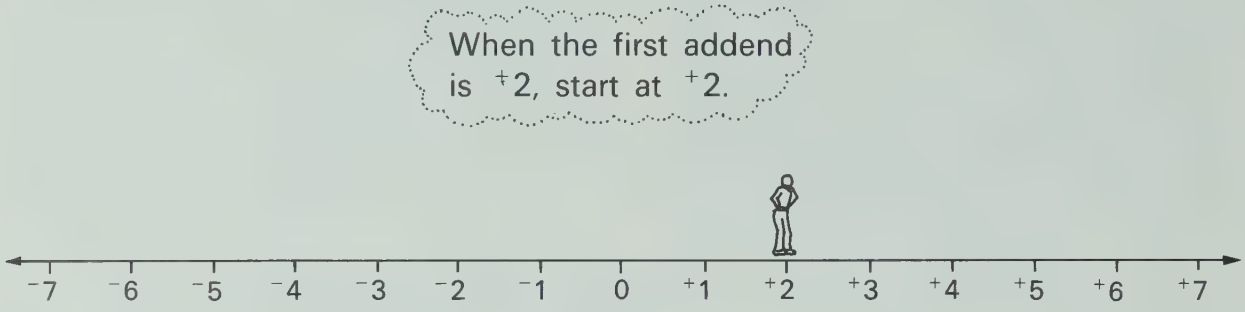
Write the standard form for each. $3^6 = 729$

6. 7^3 $7 \times 7 \times 7$ **7.** 5^4 **8.** 10^2 **9.** 4^5 **10.** 2^8

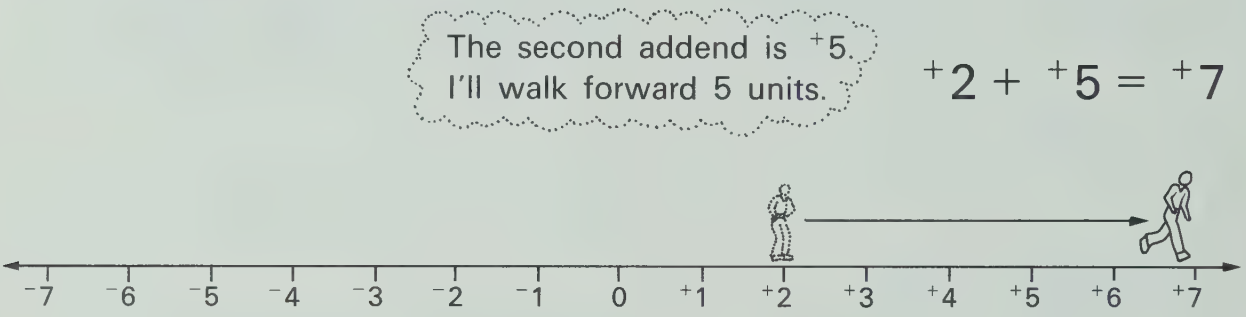
try this

Adding Integers

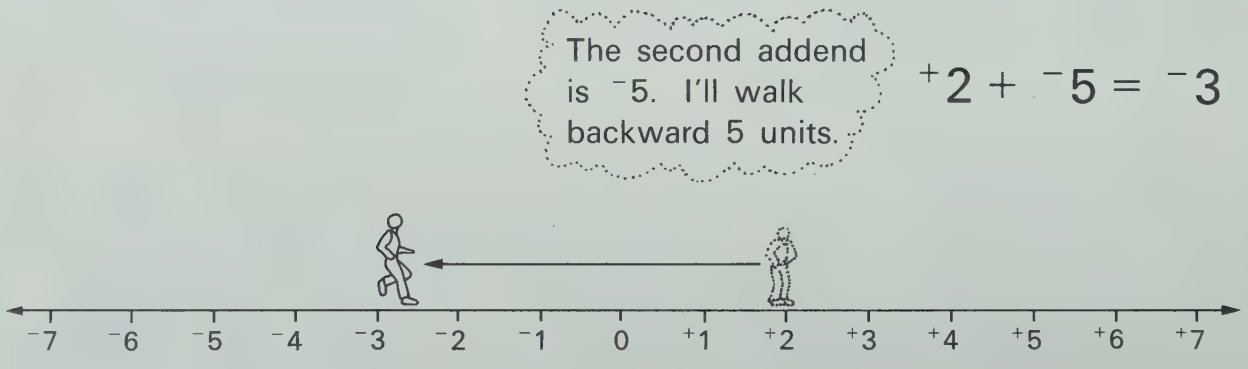
For the sum of two integers, imagine yourself standing on the number line at the point for the first addend. Face to the right.



Then walk forward if the second addend is positive.



Walk backward if the second addend is negative.



Working Together

Where will you start?

1. $^{+}7 + {}^{-}3$ **2.** $^{-}3 + {}^{+}7$

Will you walk forward or backward?

3. $^{+}4 + {}^{-}5$ **4.** $^{-}1 + {}^{+}3$

Where will you stop?

5. $^{+}4 + {}^{-}5$

6. $^{-}1 + {}^{+}3$

Add.

7. $^{+}4 + {}^{+}3$ **8.** $^{+}5 + {}^{-}3$ **9.** $^{-}6 + {}^{+}4$ **10.** $^{-}4 + {}^{-}7$

Exercises

You could use a number line to help you add.

Add.

1. $^{+}4 + {}^{-}6$	**2.** $^{+}3 + {}^{+}2$	**3.** $^{-}5 + {}^{+}1$	**4.** $^{-}2 + {}^{-}1$
5. $^{-}3 + {}^{+}7$	**6.** $^{-}1 + {}^{-}4$	**7.** $^{+}3 + {}^{-}3$	**8.** $^{+}5 + {}^{+}5$
9. $^{-}7 + {}^{-}5$	**10.** $^{+}6 + {}^{-}2$	**11.** $^{-}8 + {}^{+}8$	**12.** $^{-}6 + {}^{-}6$
13. $^{+}5 + {}^{+}9$	**14.** $^{-}1 + {}^{+}6$	**15.** $^{-}9 + {}^{-}3$	**16.** $^{+}4 + {}^{-}7$

Solve.

17. In a game, Jesse scored $^{+}7$ points. Then he scored $^{-}4$ points. How many points did he score in all?

18. Joanna scored $^{-}7$ points. Then she scored $^{+}4$ points. How many points did Joanna score in all?

19. In four rounds, Jesse scored $^{+}7$, $^{-}4$, $^{-}3$, and $^{+}5$ points. How many points did he score in all?

20. In ten rounds, Joanna scored $^{-}7$, $^{+}4$, $^{+}3$, $^{-}5$, $^{-}2$, $^{+}8$, $^{-}3$, $^{-}1$, $^{-}5$, and $^{+}9$ points. How many points did she score in all?

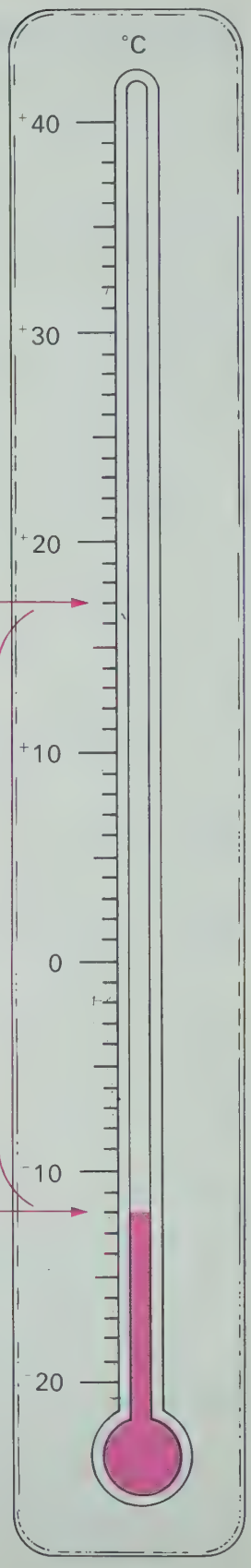
Finding Differences Between Temperatures

Positive and negative integers are used to show temperatures.

The temperature is $^{+}17°C$.

The temperature is $^{-}12°C$.

The scale on a thermometer is a vertical number line.



$^{+}17°C$ means seventeen degrees Celsius above zero.

The difference between $^{+}17°C$ and $^{-}12°C$ is twenty-nine degrees Celsius.

$^{-}12°C$ means twelve degrees Celsius below zero.

The temperature changed from $^{+}17°C$ to $^{-}12°C$.
The temperature fell twenty-nine degrees Celsius.

Working Together

Is each temperature above or below zero?

1. $^{+}8°C$ **2.** $^{-}20°C$

How far is each temperature from zero?

3. $^{-}14°C$ **4.** $^{+}26°C$

For each of these, how many degrees did the temperature change?

5. $^{+}7°C$ to $^{-}3°C$ **6.** $^{-}14°C$ to $^{+}23°C$ **7.** $^{-}6°C$ to $^{-}12°C$ **8.** $0°C$ to $^{+}15°C$

For each of these, did the temperature rise or fall?

9. $^{+}7°C$ to $^{-}3°C$ **10.** $^{-}14°C$ to $^{+}23°C$ **11.** $^{-}6°C$ to $^{-}12°C$ **12.** $0°C$ to $^{+}15°C$

Exercises

For each of these, tell how many degrees the temperature changed. Then tell whether the temperature rose or fell.

1. $^{-}7°C$ to $^{+}4°C$
2. $^{+}10°C$ to $^{-}1°C$
3. $^{-}2°C$ to $^{-}21°C$
4. $^{+}6°C$ to $^{+}9°C$
5. $^{-}8°C$ to $0°C$
6. $^{+}25°C$ to $^{-}12°C$
7. $^{-}10°C$ to $^{+}27°C$
8. $^{+}32°C$ to $^{+}17°C$
9. $^{+}3°C$ to $0°C$
10. $^{-}20°C$ to $^{-}5°C$
11. $0°C$ to $^{+}33°C$
12. $^{-}4°C$ to $^{+}16°C$
13. $^{+}19°C$ to $^{+}3°C$
14. $^{+}23°C$ to $^{-}16°C$
15. $0°C$ to $^{-}6°C$

These were the temperatures in Winnipeg for 1978 03 29. What was the change

Time	Temperature (°C)
11 : 00	$^{-}6$
12 : 00	$^{-}6$
13 : 00	$^{-}5$
14 : 00	$^{-}4$
15 : 00	$^{-}3$
16 : 00	$^{-}2$
17 : 00	$^{-}1$
18 : 00	0
19 : 00	$^{-}1$
20 : 00	0

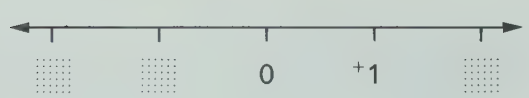
16. from 11 : 00 to 13 : 00?
17. from 13 : 00 to 18 : 00?
18. from 14 : 00 to 17 : 00?
19. from 12 : 00 to 15 : 00?
20. from 19 : 00 to 20 : 00?
21. from 16 : 00 to 19 : 00?
22. from 15 : 00 to 18 : 00?
23. from 11 : 00 to 16 : 00?
24. from 18 : 00 to 19 : 00?
25. from 17 : 00 to 20 : 00?
26. from 11 : 00 to 20 : 00?

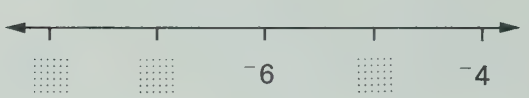
Practice

Complete.

1.

2.

3. 

4. 

Use $>$ or $<$ to make true statements.

5. $0 \bigcirc {}^{+}5$ **6.** ${}^{-}8 \bigcirc {}^{-}1$ **7.** ${}^{+}3 \bigcirc {}^{-}3$ **8.** ${}^{-}6 \bigcirc {}^{-}5$

9. ${}^{+}7 \bigcirc {}^{+}4$ **10.** ${}^{-}7 \bigcirc {}^{+}4$ **11.** $0 \bigcirc {}^{-}2$ **12.** ${}^{-}4 \bigcirc {}^{-}9$

List from least to greatest.

13. $0, {}^{-}3, {}^{-}6, {}^{-}9, {}^{+}3, {}^{+}6, {}^{+}9$

List from greatest to least.

14. ${}^{+}6, {}^{-}5, {}^{+}4, {}^{-}3, {}^{+}2, {}^{-}1$

Add.

15. ${}^{+}5 + {}^{-}6$ **16.** ${}^{+}4 + {}^{+}4$ **17.** ${}^{-}1 + {}^{-}8$ **18.** ${}^{-}3 + {}^{+}6$

19. ${}^{-}7 + {}^{-}2$ **20.** ${}^{+}2 + {}^{-}2$ **21.** ${}^{-}4 + {}^{+}1$ **22.** ${}^{-}8 + {}^{-}5$

23. ${}^{+}5 + {}^{+}2$ **24.** ${}^{-}7 + {}^{-}7$ **25.** ${}^{+}7 + {}^{-}3$ **26.** ${}^{-}6 + {}^{+}6$

Use tracing paper or copy this puzzle. Draw a path from Start to Finish that gives the greatest sum. Do not go through any space more than one time.

27.

Start	+3	−4	+5	−3	+2	−7	+2	−9
+5	−5	+6	−7	+7	−3	+4	−6	+1
−3	+3	−4	+8	−2	+6	−1	+3	−8
+6	−8	+5	−2	+4	−5	+5	−3	+1
−2	+2	−1	+3	−4	+1	−2	+7	−1
+9	−4	+7	−5	+7	−7	+9	−8	+8
−9	+1	−6	+3	−3	+6	−1	+2	Finish

For each of these, tell how many degrees the temperature changed. Then tell whether the temperature rose or fell.

28. $^{-}4°C$ to $^{-}7°C$ **29.** $^{-}3°C$ to $^{+}9°C$ **30.** $^{+}6°C$ to $0°C$

31. $^{-}17°C$ to $^{+}23°C$ **32.** $0°C$ to $^{+}14°C$ **33.** $^{+}12°C$ to $^{+}8°C$

34. $^{+}28°C$ to $^{-}14°C$ **35.** $^{-}16°C$ to $^{-}2°C$ **36.** $^{+}29°C$ to $0°C$

37. The temperature went from $^{+}8°C$ to $^{-}2°C$.

38. The temperature went from $^{-}6°C$ to $^{-}8°C$.

39. The temperature went from $^{-}7°C$ to $^{+}22°C$.

40. The temperature went from $^{+}3°C$ to $^{+}19°C$.

For each of these, give the difference between the two temperatures.

41. One day the low temperature was $^{-}7°C$. The high was $^{+}4°C$.

42. One day the temperature went from $^{-}5°C$ to $^{-}6°C$ in 2 h.

43. A temperature of $^{+}58°C$ was once recorded in North Africa. A temperature of $^{-}88°C$ was once recorded in Antarctica.

44. In Canada, a temperature of $^{-}58°C$ was once recorded and a temperature of $^{+}41°C$ was once recorded.

Exponents give a short way for writing large numbers.

$1\,000\,000 = 10^6$ $10 \times 10 \times 10 \times 10 \times 10 \times 10$

$47\,000\,000 = 47 \times 1\,000\,000$, or 47×10^6

Show each of these using exponents.

1. 100 10×10 **2.** 1000 **3.** 10 000 **4.** 100 000 000

5. 2000 **6.** 60 000 **7.** 300 **8.** 90 000 000

9. 7200 **10.** 94 000 **11.** 368 000 **12.** 5 830 000

Write the standard form for each of these.

$4.6 \times 10^3 = 4.6 \times 10 \times 10 \times 10$, or 4.6×1000

$4.6 \times 10^3 = 4600$

13. 10^7 **14.** 10^9 **15.** 10^5

16. 8×10^2 **17.** 4×10^3 **18.** 7×10^6

19. 6×10^8 **20.** 3×10^4 **21.** 2×10^3

22. 6.3×10^3 **23.** 2.75×10^5 **24.** 3.91×10^8

25. 4.2×10^9 **26.** 9.34×10^2 **27.** 5.11×10^6

try this

Thinking About Situations

Thinking about a situation can help you to decide on possible solutions.

Mary wants a bike. She has $65. The bike she wants costs $95.

What could Mary do?

I could earn some money and buy the bike later.
I could buy a cheaper bike.
I could buy a secondhand bike.
I could borrow some money and buy the bike now.

Think of other possible solutions for Mary.

Give at least four solutions for each of these.

1. Diana planned to give her friend red beads. When she went shopping, she saw some red beads for $2.25 and some blue beads for $1.98. She has $2.

2. Sylvia hopes to join the track team and also learn to play the flute by joining the school band. They both have practices at the same time. The members of the school band must attend 9 out of every 10 practices.

3. Mabel wants to buy a book that costs $1.75. She also wants to buy a pen that costs $1.29 or a pen that costs $1.69. She has $2.05.

4. It is 17:00. For dinner, Gavin wants to bake a cake at 160°C and cook a casserole at 180°C.

PROBLEM SOLVING

Checking Up

Which are positive integers?

1. $^{-}6, {}^{+}3, 0, {}^{-}3, {}^{+}6$

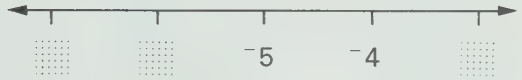
Which are negative integers?

2. $0, {}^{-}1, {}^{+}1, {}^{-}2, {}^{+}2$

Complete.

3.

4.



Use $>$ or $<$ to make true statements.

5. ${}^{+}3 \bigcirc {}^{+}6$ **6.** ${}^{+}2 \bigcirc {}^{-}4$ **7.** ${}^{-}1 \bigcirc {}^{-}5$ **8.** ${}^{-}7 \bigcirc {}^{+}3$

List from least to greatest.

9. $^{-}3, {}^{+}2, {}^{-}1, 0, {}^{+}1, {}^{-}2, {}^{+}3$

10. $^{-}7, {}^{+}6, {}^{+}3, {}^{-}5, {}^{-}2, {}^{+}1, {}^{-}4$

List from greatest to least.

11. $^{-}6, {}^{-}9, {}^{+}3, {}^{-}4, {}^{+}4, {}^{+}7, {}^{-}2$

12. $^{+}1, {}^{+}9, 0, {}^{-}8, {}^{-}3, {}^{+}5, {}^{-}7$

Add. Use a number line if you wish.

13. ${}^{+}6 + {}^{+}4$	**14.** ${}^{+}7 + {}^{-}5$	**15.** ${}^{-}4 + {}^{+}5$	**16.** ${}^{-}5 + {}^{-}5$
17. ${}^{-}5 + {}^{+}2$	**18.** ${}^{-}3 + {}^{-}4$	**19.** ${}^{+}1 + {}^{-}6$	**20.** ${}^{-}6 + {}^{-}3$
21. ${}^{+}4 + {}^{-}4$	**22.** ${}^{-}7 + {}^{+}4$	**23.** ${}^{+}2 + {}^{+}7$	**24.** ${}^{-}2 + {}^{+}2$

For each of these, tell how many degrees the temperature changed. Then tell whether the temperature rose or fell.

25. ${}^{+}1°C$ to ${}^{-}15°C$	**26.** ${}^{-}23°C$ to ${}^{+}7°C$	**27.** ${}^{-}4°C$ to $0°C$
28. ${}^{+}9°C$ to $0°C$	**29.** ${}^{+}3°C$ to ${}^{+}8°C$	**30.** ${}^{-}5°C$ to ${}^{-}13°C$
31. ${}^{+}2°C$ to ${}^{-}16°C$	**32.** $0°C$ to ${}^{-}3°C$	**33.** ${}^{+}32°C$ to ${}^{+}24°C$

Solve.

34. In two rounds of a game, Jesse scored ${}^{+}3$ points and ${}^{-}7$ points. How many points did he score in all?

35. In two rounds of a game, Joanna's scores were ${}^{-}5$ and ${}^{+}8$. What was her score for the two rounds?

36. The temperature changed from ${}^{-}6°C$ to ${}^{-}3°C$. How many degrees did the temperature change? Did it rise or fall?

37. The coldest temperature was ${}^{-}8°C$. The warmest temperature was ${}^{+}6°C$. What was the difference between the two temperatures?

Skill Practice – Adding and Subtracting Whole Numbers

Add.

1. 9876 5432	**2.** 9543 8523	**3.** 6865 3864	**4.** 25 699 1 569	**5.** 69 602 3 795
6. 19 286 92 834	**7.** 64 551 7 387	**8.** 255 008 70 007	**9.** 660 779 808 834	**10.** 987 746 712 741
11. 377 437 744	**12.** 488 372 987	**13.** 599 281 878	**14.** 98 452 7 817 43 650	**15.** 70 342 10 818 7 763
16. 4476 3367 1234 8327	**17.** 5051 4708 6650 1231	**18.** 60 066 7 323 4 394 70 071	**19.** 3339 4448 32 2567	**20.** 12 123 83 949 7 634 90 981

21. 48 224 + 782 + 50 863

22. 78 187 + 9 123 + 10 810

23. 40 427 + 44 842 + 48 841

24. 99 112 + 21 087 + 3 343

25. 32 + 81 143 + 3 434

26. 477 + 77 477 + 47

27. 526 + 65 534 + 375 + 56

28. 832 + 30 232 + 58 + 7 379

Subtract.

29. 48 27	**30.** 897 670	**31.** 6784 5434	**32.** 7829 7501	**33.** 8369 4345
34. 58 519 38 006	**35.** 76 898 26 321	**36.** 50 978 20 852	**37.** 74 965 60 314	**38.** 99 668 94 320
39. 4414 4325	**40.** 6133 3616	**41.** 81 189 61 389	**42.** 75 265 39 987	**43.** 69 359 40 997
44. 673 432 85 675	**45.** 781 234 98 748	**46.** 325 677 268 079	**47.** 515 256 156 167	
48. 604 559	**49.** 8001 5632	**50.** 87 010 76 408	**51.** 90 058 69 359	

52. 50 000 − 47 342

53. 60 050 − 54 664

54. 123 002 − 4 514

55. 454 003 − 27 028

56. 800 032 − 249 803

57. 501 001 − 439 627

Skill Practice – Multiplying and Dividing Whole Numbers

Multiply.

1. 125 × 8

2. 375 × 4

3. 1607 × 6

4. 4091 × 7

5. 9813 × 9

6. 4340 × 6

7. 9876 × 3

8. 54 076 × 5

9. 63 047 × 8

10. 70 064 × 9

11. 8342 × 40

12. 7048 × 50

13. 3994 × 60

14. 4881 × 70

15. 8088 × 80

16. 100 × 43

17. 400 × 8316

18. 6000 × 947

19. 90 × 1034

20. 4371 × 800

21. 5088 × 300

22. 7717 × 70

23. 3919 × 4000

24. 45 × 28

25. 68 × 35

26. 73 × 49

27. 87 × 78

28. 93 × 19

29. 412 × 83

30. 608 × 54

31. 7732 × 95

32. 1806 × 68

33. 43 933 × 29

34. 402 × 383

35. 648 × 450

36. 843 × 598

37. 907 × 306

38. 494 × 329

Divide.

39. $6\overline{)54}$

40. $7\overline{)56}$

41. $3\overline{)29}$

42. $9\overline{)81}$

43. $8\overline{)72}$

44. $8\overline{)68}$

45. $5\overline{)34}$

46. $4\overline{)27}$

47. $6\overline{)57}$

48. $7\overline{)50}$

49. $6\overline{)2590}$

50. $7\overline{)29\,561}$

51. $9\overline{)85\,644}$

52. $3\overline{)47\,477}$

53. $6\overline{)54\,048}$

54. $8\overline{)64\,080}$

55. $5\overline{)55\,048}$

56. $4\overline{)64\,125}$

57. $30\overline{)4930}$

58. $90\overline{)8190}$

59. $80\overline{)47\,556}$

60. $60\overline{)37\,800}$

61. $27\overline{)81}$

62. $14\overline{)850}$

63. $57\overline{)2463}$

64. $43\overline{)3040}$

65. $79\overline{)41\,010}$

66. $83\overline{)79\,721}$

67. $94\overline{)86\,260}$

68. $66\overline{)51\,593}$

69. $137\overline{)13\,997}$

70. $255\overline{)23\,985}$

71. $378\overline{)68\,484}$

72. $717\overline{)31\,348}$

73. $432\overline{)34\,432}$

74. $606\overline{)23\,484}$

75. $598\overline{)32\,816}$

76. $927\overline{)37\,594}$

Skill Practice – Adding and Subtracting Decimals

Add.

1. 43.23 + 72.79

2. 731.7 + 283.9

3. 9.019 + 3.789

4. 0.6883 + 0.4545

5. 18.805 + 3.75

6. 0.8 + 0.949

7. 24.4 + 7.588

8. 0.9097 + 1.136

9. 4.876 + 5.32 + 4.875

10. 0.7 + 5.123 + 6.277

11. 1.832 + 0.941 + 9.041

12. 0.83 + 0.0064 + 0.204

13. 6.7 + 8.54 + 7.0377 + 0.0187

14. 0.83 + 21.7 + 18.634 + 0.088

15. 9.74 + 0.9077 + 0.83 + 1.8808

16. 7.11 + 0.902 + 1.8374 + 2.0126

17. 1.0084 + 1 + 1.09 + 0.991

18. 4 + 0.68 + 1.0432 + 7

19. 4.32 + 8 + 0.7 + 0.077

20. 0.808 + 6 + 7.717 + 2

21. 7.63 + 14 + 0.118

22. 23.192 + 0.18 + 9

23. 45.85 + 23 + 15 + 0.6

24. 72.112 + 9 + 0.1188 + 6

Subtract.

25. 0.4942 − 0.3731

26. 176.44 − 98.56

27. 43.123 − 42.234

28. 10.004 − 3.095

29. 7.8 − 4.37

30. 19.8604 − 8.477

31. 0.847 − 0.53

32. 11.1 − 9.247

33. 59.1 − 10.45

34. 46.185 − 3.8

35. 70.112 − 0.9

36. 0.7 − 0.664

37. 1.844 − 1.75

38. 0.9 − 0.66

39. 10.4 − 3.58

40. 10.4 − 1.57

41. 15.832 − 0.9

42. 6.8 − 5.95

43. 4 − 2.85

44. 23.35 − 4

45. 10 − 0.8

46. 19.177 − 12

47. 17.115 − 8

48. 9 − 0.99

49. 3.68 − 2

50. 4 − 0.01

51. 33.4 − 4

52. 17 − 3.876

53. 19 − 10.1176

54. 76.137 − 75

55. 6.2 − 5

56. 9 − 4.318

57. 15 − 0.201

Skill Practice – Multiplying Decimals

Multiply.

1. 2.39 × 4	**2.** 40.8 × 5	**3.** 36.77 × 6	**4.** 89.6 × 7	**5.** 49.05 × 8
6. 89.1 × 14	**7.** 7.82 × 25	**8.** 67.3 × 36	**9.** 2.504 × 47	**10.** 4.58 × 58
11. 59.8 × 705	**12.** 9.607 × 684	**13.** 7.76 × 593	**14.** 86.5 × 484	**15.** 195.4 × 305
16. 4.6 × 3.7	**17.** 9.2 × 7.4	**18.** 7.8 × 9.6	**19.** 8.7 × 3.8	**20.** 5.4 × 4.5
21. 12.6 × 3.7	**22.** 15.8 × 5.7	**23.** 73.7 × 7.4	**24.** 98.2 × 4.7	**25.** 77.2 × 5.6
26. 10.9 × 7.3	**27.** 33.7 × 6.8	**28.** 56.8 × 5.7	**29.** 79.9 × 4.6	**30.** 81.8 × 3.9
31. 43.55 × 7.7	**32.** 26.8 × 3.78	**33.** 8.778 × 8.8	**34.** 3.56 × 4.5	**35.** 60.07 × 3.07
36. 2.17 × 7.03	**37.** 27.5 × 1.7	**38.** 3.084 × 2.7	**39.** 47.31 × 66.8	**40.** 6.01 × 1.86
41. 17.75 × 8.2	**42.** 2.808 × 77.3	**43.** 99.1 × 88.2	**44.** 60.87 × 7.08	**45.** 3.08 × 9.36

46. 14.86×5.73	**47.** 259.7×7.71	**48.** 47.37×1.3	**49.** 59.92×3.37
50. 33.07×13.7	**51.** 33.5×685.7	**52.** 5.6×56.38	**53.** 3.5×80.7
54. 1.08×722.3	**55.** 3.7×68.57	**56.** 70.17×39.9	**57.** 2.7×4.586
58. 47.09×49.3	**59.** 78.4×583.2	**60.** 1.5×66.72	**61.** 5.75×54.5

62. 0.3 × 0.2	**63.** 0.79 × 0.18	**64.** 0.07 × 0.5	**65.** 0.76 × 0.68
66. 0.26 × 0.07	**67.** 0.194 × 0.8	**68.** 0.56 × 0.37	**69.** 0.87 × 0.8
70. 0.23 × 0.09	**71.** 0.45 × 0.04	**72.** 0.077 × 0.7	**73.** 0.089 × 0.6

Skill Practice – Dividing Decimals

Divide.

1. $3\overline{)1.374}$	**2.** $5\overline{)15.9}$	**3.** $7\overline{)8.75}$	**4.** $8\overline{)5.4}$	**5.** $6\overline{)89.4}$
6. $4\overline{)8.3}$	**7.** $9\overline{)262.8}$	**8.** $2\overline{)1.81}$	**9.** $6\overline{)0.9}$	**10.** $8\overline{)59.76}$
11. $6\overline{)0.27}$	**12.** $3\overline{)739.2}$	**13.** $9\overline{)88.56}$	**14.** $5\overline{)6.62}$	**15.** $7\overline{)5.642}$
16. $8\overline{)73.4}$	**17.** $6\overline{)0.477}$	**18.** $7\overline{)69.51}$	**19.** $4\overline{)7.62}$	**20.** $4\overline{)3.9}$

21. $12\overline{)14.412}$	**22.** $34\overline{)816.68}$	**23.** $187\overline{)3496.9}$	**24.** $49\overline{)141.12}$
25. $88\overline{)374}$	**26.** $555\overline{)188.7}$	**27.** $23\overline{)14.007}$	**28.** $94\overline{)56.447}$
29. $678\overline{)552.57}$	**30.** $56\overline{)378}$	**31.** $425\overline{)343.4}$	**32.** $15\overline{)10\,266}$
33. $25\overline{)985}$	**34.** $934\overline{)532.38}$	**35.** $264\overline{)2138.4}$	**36.** $48\overline{)4008}$
37. $66\overline{)168.3}$	**38.** $85\overline{)59.925}$	**39.** $625\overline{)4025}$	**40.** $72\overline{)61.2}$
41. $45\overline{)3699}$	**42.** $118\overline{)759.92}$	**43.** $37\overline{)149.11}$	**44.** $452\overline{)4135.8}$

45. $0.2\overline{)3.4}$	**46.** $0.9\overline{)3.645}$	**47.** $0.6\overline{)1.5}$	**48.** $0.8\overline{)4.4}$
49. $0.9\overline{)2.88}$	**50.** $0.5\overline{)73}$	**51.** $0.7\overline{)4.417}$	**52.** $0.1\overline{)7.38}$
53. $0.3\overline{)6.48}$	**54.** $0.8\overline{)5.4}$	**55.** $0.4\overline{)6}$	**56.** $0.6\overline{)3}$
57. $4.6\overline{)13.11}$	**58.** $2.4\overline{)148.56}$	**59.** $7.5\overline{)705}$	**60.** $8.2\overline{)844.6}$
61. $1.1\overline{)3.597}$	**62.** $9.2\overline{)6486}$	**63.** $6.7\overline{)99.16}$	**64.** $5.9\overline{)5.074}$
65. $3.8\overline{)1767}$	**66.** $8.7\overline{)37.41}$	**67.** $5.4\overline{)513}$	**68.** $6.6\overline{)201.3}$
69. $0.48\overline{)31.2}$	**70.** $2.34\overline{)71.37}$	**71.** $3.95\overline{)363.4}$	**72.** $0.24\overline{)36}$
73. $0.76\overline{)4.94}$	**74.** $0.01\overline{)2.394}$	**75.** $6.85\overline{)9179}$	**76.** $5.03\overline{)40.24}$
77. $0.05\overline{)302}$	**78.** $1.28\overline{)32}$	**79.** $0.55\overline{)41.8}$	**80.** $7.75\overline{)7006}$
81. $5.32\overline{)321.86}$	**82.** $0.064\overline{)11.84}$	**83.** $0.001\overline{)6.001}$	**84.** $1.5\overline{)99}$
85. $0.008\overline{)24.4}$	**86.** $7.5\overline{)228}$	**87.** $6.04\overline{)25.67}$	**88.** $0.234\overline{)19.422}$

Skill Practice – Multiplying and Dividing by Multiples of 10

Multiply by 10.

1. 4 **2.** 0.7 **3.** 11
4. 87.058 **5.** 10.1 **6.** 3.102
7. 909 **8.** 1101 **9.** 74.32
10. 0.9 **11.** 0.15 **12.** 0.001
13. 1.01 **14.** 8188
15. 110.1 **16.** 543.021

Divide by 0.1.

17. 4 **18.** 0.7 **19.** 11
20. 87.058 **21.** 10.1 **22.** 3.12
23. 3.5 **24.** 13.7 **25.** 1.05
26. 0.6 **27.** 0.07 **28.** 0.085
29. 6.6 **30.** 0.007
31. 508 **32.** 30.35

Multiply by 100.

33. 8 **34.** 1.4 **35.** 2.01
36. 999 **37.** 1.001 **38.** 1101
39. 1011 **40.** 90.8 **41.** 87
42. 0,9 **43.** 0.15 **44.** 0.001
45. 333 **46.** 70.06
47. 0.008 **48.** 20.6

Divide by 0.01.

49. 8 **50.** 1.4 **51.** 2.01
52. 999 **53.** 1.001 **54.** 1101
55. 3.5 **56.** 1.37 **57.** 105
58. 0.6 **59.** 0.07 **60.** 0.085
61. 2.091 **62.** 0.09
63. 747.7 **64.** 4.043

Multiply by 1000.

65. 0.33 **66.** 10 **67.** 1.9
68. 1000 **69.** 101.1 **70.** 9.99
71. 454 **72.** 39 **73.** 3.02
74. 0.9 **75.** 15 **76.** 0.001
77. 0.008 **78.** 60
79. 697.881 **80.** 7.7

Divide by 0.001.

81. 0.33 **82.** 10 **83.** 1.9
84. 1000 **85.** 101.1 **86.** 9.99
87. 3.5 **88.** 13.7 **89.** 1.05
90. 50 **91.** 0.07 **92.** 0.085
93. 10.101 **94.** 800.8
95. 0.43 **96.** 88

Multiply by 500.

97. 16 **98.** 132
99. 0.9 **100.** 0.15
101. 0.001 **102.** 4.32

Divide by 0.002.

103. 16 **104.** 132
105. 0.9 **106.** 0.15
107. 3.5 **108.** 13.724

Multiply by 200.

109. 6312 **110.** 72
111. 10.1 **112.** 800.818
113. 0.006 **114.** 4.04

Divide by 0.005.

115. 6312 **116.** 72
117. 10.1 **118.** 800.818
119. 3.5 **120.** 13.74

Skill Practice – Dividing and Multiplying by Multiples of 10

Divide by 10.

1. 40 **2.** 162 **3.** 5.9
4. 100 **5.** 4.07 **6.** 0.777
7. 1 **8.** 15.3 **9.** 105
10. 0.07 **11.** 0.5 **12.** 1.834
13. 987.65 **14.** 430.022
15. 7000 **16.** 40.9

Multiply by 0.1.

17. 40 **18.** 162 **19.** 5.9
20. 100 **21.** 4.07 **22.** 0.777
23. 10 **24.** 1.54 **25.** 1050
26. 3.5 **27.** 13.723 **28.** 1.05
29. 9.81 **30.** 3.142
31. 28 **32.** 43.3

Divide by 100.

33. 4500 **34.** 2.8 **35.** 6700
36. 1230 **37.** 57.75 **38.** 105
39. 6 **40.** 7.2 **41.** 1
42. 0.07 **43.** 0.5 **44.** 1.8
45. 411.15 **46.** 777
47. 1.6 **48.** 0.09

Multiply by 0.01.

49. 4500 **50.** 2.8 **51.** 6700
52. 1230 **53.** 57.75 **54.** 105
55. 10 **56.** 1.83 **57.** 1050
58. 3.5 **59.** 13.7 **60.** 1.05
61. 437 **62.** 78
63. 43.6 **64.** 100.04

Divide by 1000.

65. 1000 **66.** 5000 **67.** 0.3
68. 49 **69.** 6.7 **70.** 450
71. 6 **72.** 7.2 **73.** 1
74. 3.6 **75.** 0.5 **76.** 1.8
77. 19.8 **78.** 199.9
79. 24 **80.** 700 060

Multiply by 0.001.

81. 1000 **82.** 5000 **83.** 0.3
84. 49 **85.** 6.7 **86.** 450
87. 0.2 **88.** 150 **89.** 3.8
90. 3.5 **91.** 13.7 **92.** 1.05
93. 199.4 **94.** 70 707
95. 1.7 **96.** 14.8

Divide by 200.

97. 30 000 **98.** 400 000
99. 600 **100.** 845.48
101. 1000.5 **102.** 0.06

Multiply by 0.005.

103. 30 000 **104.** 400 000
105. 6000 **106.** 8454.8
107. 3.5 **108.** 13.7

Divide by 500.

109. 55 000 **110.** 60
111. 850 000 **112.** 7047
113. 1798 **114.** 7485

Multiply by 0.002.

115. 55 000 **116.** 60
117. 8 500 000 **118.** 7047
119. 459 **120.** 15

Skill Practice–Adding and Subtracting Fractions

Add.

1. $\frac{1}{6}$ + $\frac{4}{6}$

2. $\frac{4}{7}$ + $\frac{2}{7}$

3. $\frac{2}{10}$ + $\frac{7}{10}$

4. $1\frac{4}{8}$ + $2\frac{3}{8}$

5. $\frac{6}{12}$ + $\frac{5}{12}$

6. $3\frac{2}{9}$ + $4\frac{5}{9}$

Subtract.

7. $\frac{5}{6}$ − $\frac{1}{6}$

8. $\frac{5}{7}$ − $\frac{2}{7}$

9. $\frac{7}{10}$ − $\frac{2}{10}$

10. $\frac{6}{8}$ − $\frac{3}{8}$

11. $3\frac{9}{12}$ − $1\frac{5}{12}$

12. $4\frac{4}{5}$ − $2\frac{3}{5}$

Add. Give the sums in lowest terms.

13. $\frac{3}{5}$ + $\frac{3}{10}$

14. $\frac{1}{8}$ + $\frac{1}{4}$

15. $\frac{1}{2}$ + $\frac{1}{6}$

16. $\frac{1}{12}$ + $\frac{2}{3}$

17. $\frac{1}{2}$ + $\frac{1}{10}$

18. $\frac{1}{3}$ + $\frac{4}{9}$

19. $\frac{2}{3}$ + $\frac{1}{6}$

20. $\frac{11}{20}$ + $\frac{1}{5}$

21. $\frac{2}{5}$ + $\frac{3}{20}$

22. $\frac{2}{3}$ + $\frac{1}{4}$

23. $\frac{1}{2}$ + $\frac{3}{7}$

24. $\frac{1}{4}$ + $\frac{5}{8}$

25. $\frac{3}{20} + \frac{1}{4}$

26. $\frac{1}{3} + \frac{3}{5}$

27. $\frac{3}{10} + \frac{3}{20}$

28. $\frac{3}{4} + \frac{1}{5}$

29. $\frac{1}{2} + \frac{1}{3}$

30. $\frac{2}{9} + \frac{1}{2}$

31. $\frac{1}{8} + \frac{3}{4} + \frac{1}{16}$

32. $\frac{3}{8} + \frac{1}{4} + \frac{3}{16}$

33. $\frac{1}{12} + \frac{1}{4} + \frac{1}{3}$

34. $\frac{1}{5} + \frac{3}{10} + \frac{7}{20}$

35. $\frac{3}{4} + \frac{1}{10} + \frac{1}{20}$

36. $\frac{1}{6} + \frac{1}{8} + \frac{5}{12}$

37. $1\frac{3}{4}$ + $2\frac{1}{2}$

38. $3\frac{3}{8}$ + $1\frac{15}{16}$

39. $4\frac{1}{2}$ + $2\frac{5}{6}$

40. $2\frac{3}{4}$ + $3\frac{7}{16}$

41. $7\frac{5}{9}$ + $4\frac{2}{3}$

42. $5\frac{3}{5}$ + $\frac{7}{10}$

43. $1\frac{7}{20}$ + $2\frac{7}{10}$

44. $3\frac{9}{16}$ + $\frac{7}{8}$

45. $7\frac{8}{9}$ + $1\frac{1}{3}$

46. $9\frac{1}{2}$ + $10\frac{7}{10}$

47. $6\frac{3}{8} + 1\frac{3}{4}$

48. $1\frac{9}{10} + \frac{11}{20}$

49. $2\frac{4}{5} + 3\frac{1}{5}$

50. $6\frac{5}{9} + 1\frac{1}{2}$

51. $\frac{13}{20} + 1\frac{7}{10}$

52. $4\frac{8}{9} + 3\frac{1}{3}$

53. $9\frac{13}{18} + \frac{7}{9}$

54. $10\frac{4}{7} + 2\frac{1}{2}$

55. $7\frac{3}{8} + \frac{5}{8}$

56. $5\frac{13}{20} + 3\frac{3}{5}$

57. $3\frac{3}{4} + 1\frac{11}{20}$

58. $\frac{2}{3} + 4\frac{4}{5}$

Skill Practice – Subtracting and Multiplying Fractions

Subtract. Give the differences in lowest terms.

1. $\frac{4}{5}$ $-\frac{7}{10}$	**2.** $\frac{5}{6}$ $-\frac{2}{3}$	**3.** $\frac{2}{3}$ $-\frac{7}{12}$	**4.** $\frac{13}{20}$ $-\frac{2}{5}$	**5.** $\frac{1}{2}$ $-\frac{3}{16}$	**6.** $\frac{7}{8}$ $-\frac{7}{16}$
7. $\frac{2}{3}$ $-\frac{1}{9}$	**8.** $\frac{3}{4}$ $-\frac{3}{8}$	**9.** $\frac{15}{16}$ $-\frac{7}{8}$	**10.** $\frac{13}{16}$ $-\frac{3}{4}$	**11.** $\frac{11}{16}$ $-\frac{1}{2}$	**12.** $\frac{4}{5}$ $-\frac{11}{20}$
13. $4\frac{2}{3}$ $-1\frac{11}{12}$	**14.** $5\frac{3}{5}$ $-4\frac{7}{10}$	**15.** $6\frac{1}{3}$ $-5\frac{5}{6}$	**16.** $1\frac{1}{16}$ $-\frac{5}{8}$	**17.** $7\frac{1}{3}$ $-5\frac{7}{9}$	**18.** $9\frac{1}{10}$ $-4\frac{1}{2}$
19. $8\frac{3}{10}$ $-3\frac{4}{5}$	**20.** $7\frac{17}{20}$ $-2\frac{9}{10}$	**21.** $4\frac{1}{7}$ $-\frac{1}{3}$	**22.** $3\frac{2}{7}$ $-1\frac{2}{3}$	**23.** $4\frac{3}{7}$ $-3\frac{1}{2}$	**24.** $3\frac{5}{8}$ $-2\frac{2}{3}$

25. $6 - \frac{17}{20}$	**26.** $7 - \frac{15}{16}$	**27.** $2 - \frac{7}{12}$	**28.** $3 - \frac{2}{3}$
29. $5\frac{1}{12} - 1\frac{1}{2}$	**30.** $6\frac{1}{2} - 1\frac{7}{12}$	**31.** $3\frac{7}{8} - 1\frac{15}{16}$	**32.** $3\frac{1}{4} - 2\frac{13}{16}$

Multiply. Give the products in lowest terms.

33. $\frac{1}{2} \times \frac{3}{4}$	**34.** $\frac{7}{8} \times \frac{5}{6}$	**35.** $\frac{3}{5} \times \frac{1}{5}$	**36.** $\frac{1}{6} \times \frac{5}{6}$
37. $\frac{3}{10} \times \frac{2}{5}$	**38.** $\frac{5}{12} \times \frac{4}{10}$	**39.** $\frac{8}{9} \times \frac{5}{12}$	**40.** $\frac{7}{9} \times \frac{5}{7}$
41. $\frac{1}{4} \times \frac{3}{5}$	**42.** $\frac{7}{8} \times \frac{2}{3}$	**43.** $\frac{4}{5} \times \frac{1}{2}$	**44.** $\frac{3}{7} \times \frac{5}{6}$
45. $\frac{3}{8} \times \frac{2}{9}$	**46.** $\frac{3}{4} \times \frac{6}{7}$	**47.** $\frac{1}{9} \times \frac{1}{9}$	**48.** $\frac{2}{5} \times \frac{4}{7}$
49. $\frac{4}{5} \times \frac{3}{10}$	**50.** $\frac{3}{7} \times \frac{1}{2}$	**51.** $\frac{2}{5} \times \frac{1}{3}$	**52.** $\frac{3}{8} \times \frac{3}{8}$
53. $8 \times \frac{2}{3}$	**54.** $7 \times \frac{5}{7}$	**55.** $\frac{3}{4} \times 11$	**56.** $15 \times \frac{2}{5}$
57. $\frac{3}{5} \times 3$	**58.** $42 \times \frac{2}{7}$	**59.** $7 \times \frac{1}{12}$	**60.** $\frac{5}{9} \times 18$
61. $27 \times \frac{2}{9}$	**62.** $\frac{7}{12} \times 18$	**63.** $\frac{4}{7} \times 21$	**64.** $4 \times \frac{3}{8}$
65. $\frac{2}{3} \times 4$	**66.** $3 \times \frac{2}{9}$	**67.** $15 \times \frac{3}{10}$	**68.** $\frac{5}{6} \times 2$

Skill Practice – Dividing Fractions and Percent

Divide. Give the quotients in lowest terms.

1. $\frac{1}{2} \div 8$ **2.** $\frac{3}{4} \div 10$ **3.** $\frac{7}{8} \div 7$ **4.** $\frac{5}{12} \div 15$

5. $6 \div \frac{3}{4}$ **6.** $2 \div \frac{2}{3}$ **7.** $12 \div \frac{5}{6}$ **8.** $12 \div \frac{4}{5}$

9. $\frac{1}{2} \div \frac{1}{2}$ **10.** $\frac{1}{4} \div \frac{3}{4}$ **11.** $\frac{9}{10} \div \frac{3}{20}$ **12.** $\frac{4}{7} \div \frac{2}{5}$

13. $\frac{7}{12} \div \frac{6}{7}$ **14.** $\frac{9}{10} \div \frac{3}{5}$ **15.** $\frac{11}{12} \div \frac{1}{6}$ **16.** $\frac{2}{3} \div 4$

17. $\frac{7}{8} \div \frac{7}{8}$ **18.** $8 \div \frac{4}{7}$ **19.** $\frac{5}{7} \div \frac{5}{9}$ **20.** $\frac{1}{5} \div \frac{3}{10}$

21. $1 \div \frac{5}{8}$ **22.** $\frac{4}{5} \div \frac{2}{3}$ **23.** $\frac{3}{8} \div \frac{9}{10}$ **24.** $14 \div \frac{7}{8}$

25. $\frac{9}{10} \div \frac{3}{4}$ **26.** $\frac{7}{8} \div 4$ **27.** $10 \div \frac{2}{5}$ **28.** $\frac{4}{7} \div \frac{4}{5}$

29. $\frac{2}{5} \div 4$ **30.** $\frac{5}{6} \div \frac{1}{3}$ **31.** $5 \div \frac{6}{7}$ **32.** $\frac{2}{5} \div \frac{1}{2}$

Copy and complete.

	Percent / Number	1%	7%	15%	25%	35%	50%
33.	1000						
34.	50						
35.	84						
36.	18						
37.	17						
38.	5						
39.	2						
40.	15						
41.	48						
42.	16						
43.	57						
44.	144						

Find each of these.

45. 3% of 15 **46.** 18% of 50 **47.** 44% of 25 **48.** 90% of 32

Glossary

Acute angle: an angle whose measure is greater than 0° but less than 90°.

Addend: *see* Addition.

Addition: an operation that combines two or more numbers, called *addends*, to give exactly one number, called the *sum*.

$$10 + 8 + 5 = 23$$

addends sum

Angle: two rays with the same end point.

Area: the number of unit squares needed to cover a region.

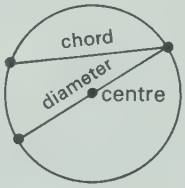
Array: an arrangement of objects in rows and columns. This array has 3 rows and 5 columns.

Average: the quotient obtained by dividing the sum of a set of numbers by the number of addends.

Capacity: the amount a container can hold.

Centre (of a circle): the point that is the same distance from all the points of a circle.

Chord (of a circle): a line segment with both end points on a circle.



Circle: a closed curve all of whose points are the same distance from the centre.

Circumference: the distance around a circle.

Common (like) denominator: a common multiple of two or more denominators. 12 is a common denominator for $\frac{1}{6}$ and $\frac{1}{4}$.

Common factor: a number that is a factor of two or more numbers. 3 is a common factor of 6 and 18.

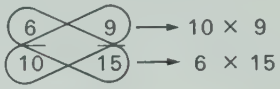
Common multiple: a number that is a multiple of two or more numbers. 18 is a common multiple of 2 and 3.

Composite number: a number that has factors other than itself and 1.

Cone: a three-dimensional figure shaped like this.

Congruent figures: geometric figures that have the same size and shape.

Cross products: two products formed from the numbers in two fractions or ratios, like this.



Cube: a rectangular prism with each of its six faces a square.

Cylinder: a three-dimensional figure shaped like this.

Decagon: a polygon with ten sides.

Decimal: numerals such as 0.125, 1.25, and 12.5 are decimals. The position of the *decimal point* determines the place values of the digits.

Degree (of an angle): a unit for measuring angles.

Degree (of temperature): a degree Celsius is one-hundredth of the difference in temperature between the boiling point and the freezing point of water.

Denominator: in the fraction $\frac{3}{4}$ the denominator is 4. It represents the number of equal parts into which a whole has been divided, or the number of wholes that are being considered, or the second term in a ratio.

Diameter: a line segment having end points on a circle and containing the centre. *See* Circle.

Difference: *see* Subtraction.

Digit: any of the individual symbols used to write numerals. In the base-ten system, the digits are 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

Discount: an amount by which a price is reduced. It is often stated as a fraction or a percent of the price.

Dividend: *see* Division.

Division: the operation of finding either the number of equal groups or the number in each of equal groups.

$$\begin{array}{r} 5 \leftarrow \text{quotient} \\ \text{divisor} \rightarrow 7\overline{)37} \leftarrow \text{dividend} \\ \underline{35} \\ 2 \leftarrow \text{remainder} \end{array}$$

Divisor: *see* Division.

Edge: the line segment where two faces of a three-dimensional figure meet.

End point: the end of a line segment or a ray.

Equation: a mathematical sentence that uses the symbol $=$, such as $17 + 2 - 11 = 8$.

Equilateral triangle: a triangle with its three sides of equal length.

Equivalent fractions: fractions that name the same number. $\frac{1}{2}$, $\frac{2}{4}$, and $\frac{3}{6}$ are equivalent fractions.

Equivalent ratios: ratios whose cross products are equal. $\frac{5}{6}$ and $\frac{10}{12}$ are equivalent because $5 \times 12 = 6 \times 10$.

Estimate: an approximate result found by rounding the numbers in an operation or by making a thoughtful guess.

Even number: a whole number for which 2 is a factor.

Expanded form: a form of a numeral written as the sum of its digits with each digit showing its value. $7000 + 800 + 50 + 6$ is an expanded form for 7856.

Exponent: a number showing how many times another number is used as a factor.

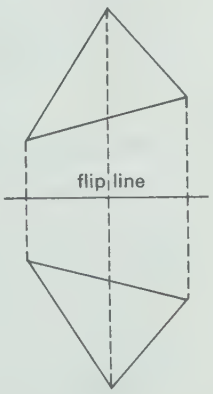
$5 \times 10 \times 10 \times 10 = 5 \times 10^3$ ← exponent

Face: a flat surface of a three-dimensional figure.

Factor: *see* Multiplication.

Flip: describes a motion that matches points in two congruent shapes like this.

Flip image: the flip image of a shape is congruent to the shape. Each point of the shape and its matching point of the flip image are the same distance from a line but on opposite sides of it. The line is called the *flip line*.



Flip line: *see* Flip image.

Fraction: numerals such as $\frac{2}{3}$, $\frac{2}{2}$, and $\frac{6}{4}$ are fractions. They represent parts of a whole, or parts of a set, or a ratio. When the numerator is less than the denominator as in $\frac{2}{3}$, the numeral is a *proper fraction*. When the numerator is equal to or greater than the denominator, as in $\frac{2}{2}$ and $\frac{6}{4}$, the numeral is an *improper fraction*.

Graph:
(i) a picture used to show information. It may be a bar graph, a circle graph, a line graph, or a pictograph.
(ii) points on a grid matched with given ordered pairs.

Greater than ($>$): describes a relation between two numbers that are not equal, such as $6 > 4$.

Greatest common factor: the greatest of the factors common to two or more numbers. 4 is the greatest common factor of 8, 12, and 24.

Hexagon: a polygon with six sides.

Integer: . . ., $^-3$, $^-2$, $^-1$, 0, $^+1$, $^+2$, $^+3$, . . . are the integers. An integer may be positive or negative. 0 is neither positive nor negative.

Interest: money paid for the use of money.

Intersecting lines: two lines with exactly one point in common.

Intersection: the one point common to intersecting lines.

Isosceles triangle: a triangle with two sides of equal length.

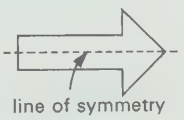
Least common multiple: the least of the multiples common to two or more numbers. 12 is the least common multiple of 4 and 6.

Less than ($<$): describes a relation between two numbers that are not equal, such as $4 < 6$.

Like denominator: *see* Common denominator.

Line: a straight path that continues without end.

Line of symmetry: a line that divides a shape into two parts that can be matched by folding the shape in half.



Line segment: a part of a line. It has two end points.

Line symmetry: a property of any shape that can be folded in half so that the two parts match.

Lowest-terms fraction: a fraction whose numerator and denominator have no common factor greater than 1.

Mass: the amount of matter in a body.

Minuend: *see* Subtraction.

Mixed form: a number is in mixed form when it is expressed as a whole number and a fraction.

Multiple: a multiple of a number is the product of that number and a whole number. 0, 3, 6, 9, 12, . . . are the multiples of 3.

Multiplication: an operation that combines numbers, called *factors*, to give one number, called the *product*.

$$3 \times 7 = 21$$

factors product

Number line: a drawing that matches a set of numbers and a set of points in a line, one to one.

Number sentence: a statement about the relation between two numbers, such as

$$2 + 7 = 9, \quad 3 < 6, \quad 5 > 2.$$

Numeral: a symbol, or a group of symbols, that represents a number. FIVE, 5, V, 2 + 3, 9 − 4 and 𝍸 are numerals.

Numerator: in the fraction $\frac{3}{4}$ the numerator is 3. It represents the number of equal parts of a whole, or the number of parts of a set that are being considered, or the first term in a ratio.

Obtuse angle: an angle whose measure is greater than 90° but less than 180°.

Octagon: a polygon with eight sides.

Odd number: a whole number for which 2 is not a factor.

Ordered pair: a pair of numbers for which the order is important. (2, 6) and (6, 2) are different ordered pairs.

Parallel lines: lines in the same plane that do not intersect.

Parallelogram: a quadrilateral whose opposite sides are parallel.

Parentheses: the symbols ( ). Parentheses indicate the numbers that are to be combined first.

Pentagon: a polygon with five sides.

Percent: a ratio that compares an amount to 100.

6 out of 25 is $\frac{6}{25}$, or $\frac{24}{100}$, or 24%.

Perimeter: the distance around a closed figure.

Perpendicular lines: two lines that intersect to form right angles.

Place value: the value given to the place in which a digit appears in a numeral. In 735, 7 is in the hundreds place, 3 is in the tens place, and 5 is in the ones place.

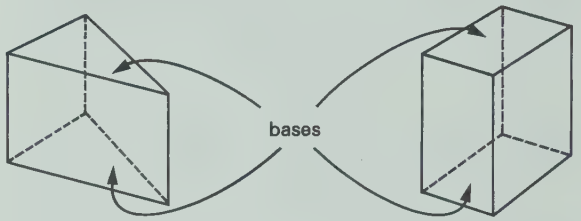
Plane: a flat surface whose length and width have no limits.

Point: a point marks a position. It has no size and is usually represented by a dot.

Polygon: a closed figure made up of line segments.

Prime number: a whole number, greater than 1, that has only two factors, itself and 1.

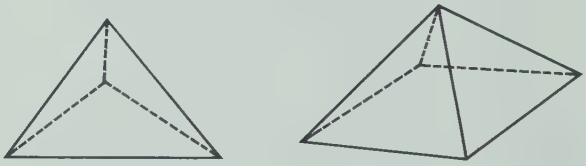
Prism: a three-dimensional figure with two congruent parallel faces called *bases*.



triangular prism rectangular prism

Product: *see* Multiplication.

Pyramid: a three-dimensional figure whose base is a polygon and whose other faces are triangles.



triangular pyramid square pyramid

Quadrilateral: a polygon with four sides.

Quotient: *see* Division.

Radius: a line segment whose end points are the centre of a circle and a point on the circle.

Rate: a comparison of the change in one thing with the change in another. $89.50 a week, three pills a day.

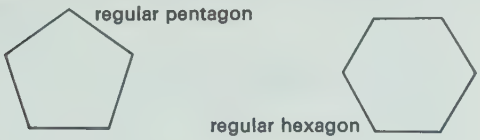
Ratio: a pair of numbers used to make a comparison. The ratio of 4 to 5 is written 4:5 or $\frac{4}{5}$.

Ray: a part of a line. It has one end point and continues without end in one direction.

Reciprocal: two numbers are reciprocals if their product is 1. 4 and $\frac{1}{4}$ are reciprocals. $\frac{3}{2}$ and $\frac{2}{3}$ are also reciprocals.

Rectangle: a parallelogram with four right angles.

Regular polygon: a polygon that has all sides of equal length and all angles of equal measure.



Remainder: *see* Division.

Rhombus: a parallelogram with four sides of equal length.

Right angle: an angle whose measure is 90°.

Roman numerals: seven capital letters used alone and combined in certain ways to represent numbers. I = 1, V = 5, X = 10, L = 50, C = 100, D = 500, M = 1000.

Rotational (turn) symmetry: a shape that fits onto itself after a turn less than a full turn has rotational symmetry.

Rounded number: a number expressed to the nearest ten, hundred, thousand, and so on. 348 rounded to the nearest ten is 350.

Scale: the ratio of the distance between two points on a map or on a diagram to the distance between the actual locations.

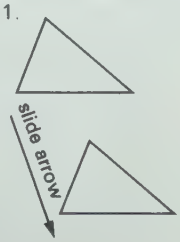
Scalene triangle: a triangle with its three sides of different lengths.

Side: a line segment forming a polygon.

Similar figures: figures that have the same shape but not always the same size.

Simplest-form ratio: a ratio using whole numbers that have no common factor greater than 1.

Slide: describes a motion that matches points in two congruent shapes like this.



Slide arrow: an arrow that shows the distance and direction of a slide.

Slide image: when each point of a shape is the same distance from the matching point of its congruent image, the image is a slide image.

Solid: a three-dimensional figure.

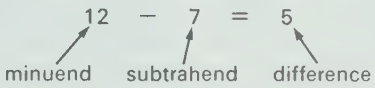
Sphere: a three-dimensional figure that looks like this.

Square: a rectangle with its four sides of equal length.

Standard form: the form of a numeral with each digit having a place value, in multiples of 10, according to its position in relation to the other digits. 7856 is the standard form for 50 + 800 + 6 + 7000.

Straight angle: an angle whose measure is 180°.

Subtraction: an operation on two numbers that tells how much greater one number is than the other.



Subtrahend: *see* Subtraction.

Sum: *see* Addition.

Symmetric shape: a shape that can be folded in half so that the two parts match.

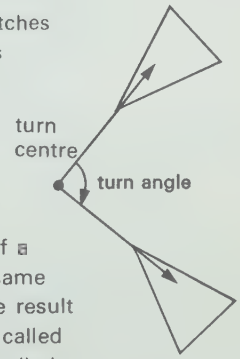
Tessellation: a tiling pattern made with one shape.

Tiling: the process of using congruent shapes to cover a region completely.

Trapezoid (trapezium): a quadrilateral with one pair of parallel sides.

Triangle: a polygon with three sides.

Turn: describes a motion that matches points in two congruent shapes like this.



Turn angle: *see* Turn image.

Turn centre: *see* Turn image.

Turn image: when each point of a shape is turned through the same angle about a given point, the result is a turn image. The angle is called the *turn angle.* The point; is called *turn centre.*

Vertex: the common end point of the two rays of an angle, two sides of a polygon, or three or more edges of a solid.

Volume: the amount of space occupied by an object.

Symbols

mm	millimetre	kg	kilogram
cm	centimetre	t	tonne
dm	decimetre	°C	degree Celsius
m	metre	s	second
dam	decametre	min	minute
hm	hectometre	h	hour
km	kilometre	d	day
cm^2	square centimetre	+	plus
m^2	square metre	−	minus
ha	hectare	×	times
km^2	square kilometre	÷	divided by
cm^3	cubic centimetre	=	is equal to, equals
dm^3	cubic decimetre	≠	is not equal to
m^3	cubic metre	>	is greater than
mL	millilitre	<	is less than
L	litre	:	ratio
g	gram	%	percent

Table of Related Units

10 mm = 1 cm	(10 millimetres = 1 centimetre)
10 cm = 1 dm	(10 centimetres = 1 decimetre)
10 dm = 1 m	(10 decimetres = 1 metre)
100 cm = 1 m	(100 centimetres = 1 metre)
1000 mm = 1 m	(1000 millimetres = 1 metre)
10 m = 1 dam	(10 metres = 1 decametre)
10 dam = 1 hm	(10 decametres = 1 hectometre)
10 hm = 1 km	(10 hectometres = 1 kilometre)
1000 m = 1 km	(1000 metres = 1 kilometre)
10 000 m^2 = 1 ha	(10 000 square metres = 1 hectare)
1000 mL = 1 L	(1000 millilitres = 1 litre)
1000 g = 1 kg	(1000 grams = 1 kilogram)
1000 kg = 1 t	(1000 kilograms = 1 tonne)
60 s = 1 min	(60 seconds = 1 minute)
60 min = 1 h	(60 minutes = 1 hour)
24 h = 1 d	(24 hours = 1 day)
7 d = 1 week	(7 days = 1 week)
365 d = 1 year	(365 days = 1 year)
52 weeks = 1 year	10 years = 1 decade
12 months = 1 year	100 years = 1 century

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